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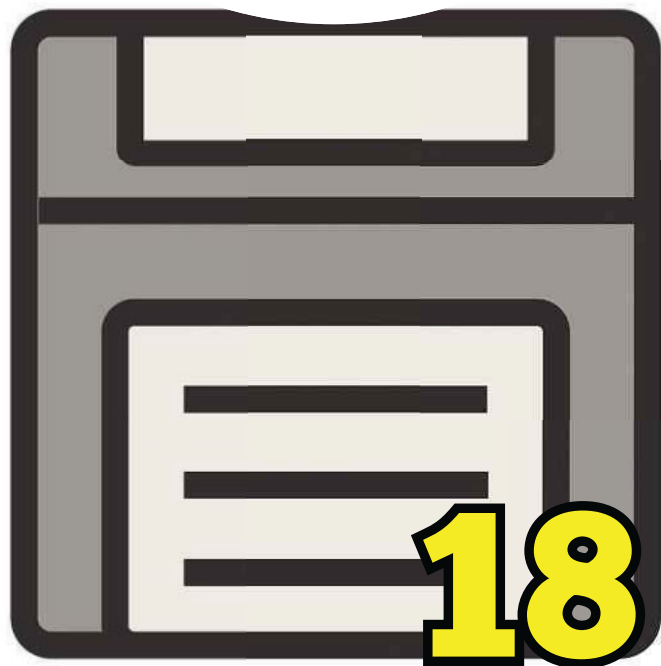
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How To Record Anything



Spying Technology

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Once again, tracking technology has been in the news, thanks to its illegal use in certain toys. Yet similar forms of tracking and surveillance can be found in many everyday electronic gadgets, whether it's webcams secretly recording or microphones listening to what you say, there are many potential ways that your technology could be spying on you. David Crookes has been finding out more

18 How To Record Anything

Although video-on-demand services make it less necessary than it used to be, being able to record video on your PC is still useful. And you might not even want to record TV. With the right tools, you can make videos of yourself playing games or even put together tutorial videos, showing how to use certain software. It's easier than you might think

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Facebook, like a lot of big websites, likes to change things around fairly regularly, but the latest alterations to its news feed algorithm could be detrimental to brands that use the social network. What are they, though, and will they affect everyday users as well? Sarah Dobbs logs in and takes a look



Brands And Facebook

SPY



50 Drone Buyer's Guide



60 World Beating Technology

50 Drone Buyers' Guide

Pop into any toy shop in the country, and you'll likely find a few drones on sale, and some of them probably cost less than £30. Why, then, would you spend more than a hundred, or even a thousand, pounds? For a lot of reasons, it seems, and to give you an idea of just what you get for your money, we've been looking at a range of drones, starting from £150 and going right up to £1,200

58 Micro:Bit Coding

The BBC's Micro:Bit pocket-sized computer has taken a fair while to reach us, but sales have now been opened to the public. Once you get your hands on one, though, what are you going to do with it? Well, why not follow our new weekly coding guide, where David Briddock will be getting to grips with what this diminutive little fella can do

60 World Beating Technology

Ever wondered what the fastest processor is that you can buy right now, or what the biggest monitor is on the market? We have, so we went looking, to see if we could find out what technology is sitting on the top of the pile right now, as well as how much of it is actually available to regular people. Brace yourselves, though, because some of it's very expensive!

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WHO'S TRACKING YOU?

Consumer technology is being used to potentially track you, but who's watching and why?

In the lead-up to Christmas, parents everywhere will encourage their children to be on their best behaviour by uttering the well-trodden phrase, "Santa will be watching you." As everyone knows, Father Christmas keeps a check on kids across the globe, delivering the best presents to the most angelic of children, and potatoes to all of those he deems to be little terrors (cut out and keep this paragraph as written proof, parents).

What parents will never threaten is, "Be careful what you do and say, because those toys we bought you have ears." After all, that Fisher-Price Smart Toy looks innocent enough, with its cute, fluffy over-sized face and ability to make you laugh with its funny jokes. But according to security experts, there could be more than meets the eye with the new wave of internet-connected toys.

"Security issues in the Fisher-Price Smart Toy would potentially allow an

attacker to manipulate its actions, enabling them to indirectly interact with a child playing with the toy," says security expert Mark Stanislav. He tells us that it is only a matter of time before such connected toys are infiltrated by hackers and that toy manufacturers appear to be neglecting such problems, putting kids at risk of online threats.

Stanislav and his team at Rapid7, a cybersecurity firm, which published its research into connected toys in February



WHO'S TRACKING YOU?

provided about a child – for example, their name, birthdate, gender and language,” Stanislav says. The problem was that the software and apps were not appropriately verifying who was trying to access its information. The researchers say the flaw could have allowed an attacker to take control of the device and potentially monitor whether a child was playing with it.

Mattel, which owns Fisher-Price, said there was no evidence of anyone stealing customer information because of the problem, and it was quickly fixed, ensuring that anyone owning one today will not be affected. Yet it appears that this toy was not alone. Rapid7 also looked at the HeroO, a GPS smartwatch that allows parents to track their child's location, and they discovered that the whereabouts of children were being stored in the cloud and that hackers may be able to access such data.

Again, the flaw was fixed, but it does show the inherent problems of connecting children's toys online and the steps that manufacturers need to take. “These unauthorised actions were possible because of a flaw in how the associated mobile application's back-end service was checking that a requested action or piece of information should be handled. Prior to these problems being fixed, any logged-in account could request actions and information of any other account,” says Stanislav.

On The Right Tracks?

Rapid7's findings touch on a much wider issue. More and more devices are being connected online, and the drive for an Internet of Things is showing no sign of slowing down. Yet with this comes a danger that we're sharing an increasing amount of information about ourselves and what we're up to on a daily basis. What appears innocent on the outside may not always be used for the purest of intentions, with hackers always on the lookout for new ways to gather data and find a way into our networks.

“Hijacking a Fisher-Price Smart Toy would mostly prove to be a nuisance for customers of the device, rather than representing more serious risk,” says Stanislav. “This is due to limitations put in place by the toy's manufacturer: the Smart Toy doesn't natively allow recording audio or images, which limits how an attacker could use it to interact with a child or spy on them.

“With the issues that were found, the direct outcome of hijacking a toy

“ Attackers could steal information provided about a child ”

this year, came to their conclusion after carefully examining Fisher-Price's Smart Toy. It's an impressive product, which comes in three guises – a monkey, a bear and a panda – and it not only engages children in conversation but plays games and listens to what a child has to say.

It connects to wi-fi, comes with a free parent app and promises to become smarter over time, remembering things

and taking cues from a kid so it can invite him or her to play or exercise their imagination. According to Dr Kathleen Kremer, the Fisher-Price PlayLab early childhood development expert, it encourages social-emotional development, imagination and creativity.

But a security flaw meant that a hacker could potentially infiltrate the toy. “Attackers could steal information

would be to harass a child or their family when the toy acts in a manner not being expected. For other connected toys, the risk may not be so limited. Attackers could potentially monitor microphones, cameras and similar devices if the manufacturers do not take the same kind of steps that Fisher-Price took in making the Smart Toy."

Toys are not the only form of potential tracking or surveillance in consumer technology, but it does seem that toy manufacturers have taken a beating this year when it comes to such an issue. In the US, the New York Attorney General, Eric Schneiderman said that he had led a two-year probe into four companies – Viacom, Mattel, Hasbro and JumpStart Games – and found that they had violated the Children's Online Privacy Protection Act.

It turned out they were using technology that had allowed third-party vendors to collect and use personal information from children under the age of 13 without parental approval. Marketers were tracking cookies and IP addresses on sites such as those linked with Nick Jr, Barbie, Hot Wheels, My Little Pony and Neopets. By using adverts on these child-friendly

websites, they were able to track online activities and interests. It led to fines totalling \$835,000.

"We used to worry about our children wandering into bad neighbourhoods; now our children live online," Schneiderman said. "Many of the sites that are home to some of our most popular TV shows [and] toys were littered with technology that can be used to track every move a child makes on that site."

Of course, we're growing used to this kind of thing. Many of the websites that we visit will track you and learn about your behaviour, but it feels infinitely worse when children are involved. It also feels more of a violation when you're using devices that you feel ought not to be gathering information about you, be it a toy or some other consumer tech that you've bought into. Stanislav says companies employing such technology



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► **Toy companies have been criticised for tracking online activity and collecting personal data on many child-friendly websites**



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in their products have to work hard at ensuring they're watertight.

"Technology vendors need to consider security from the outset and identify ways to both build security in by design," he tells us. "They also need to provide means for security issues to be reported and quickly addressed within the technology development lifecycle. For many technology vendors, this is still a huge challenge. The Internet of Things is evolving rapidly in terms of technologies used and techniques to secure it."

To help, the Online Trust Alliance has created an 'IoT Trust Framework' (goo.gl/SD6cBp) that helps vendors become aware of the security and privacy implications of engineering connected devices. Another group, BuildItSecure.ly, partners with IoT vendors and provides pro-bono assistance in testing devices prior to going to market to help limit problems consumers face.

“ There’s no question a camera cover is becoming increasingly essential ”

"Ultimately, connected-toy vendors should retain security expertise early in their engineering process and leverage those resources throughout the device's lifecycle to ensure problems are found and fixed as quickly as possible, and limit the overall risks consumers may face in the first place," Stanislav continues.

Keeping Watch

But what other devices are keeping watch on us? One of the biggest concerns relates to internet-connected cameras. You may recall Facebook founder Mark Zuckerberg was pictured with tape over the webcam and microphone of his Apple laptop. Well, in recent weeks, the FBI director James Comey says he does exactly

the same. They're protecting themselves from so-called ratters – hackers who carry out remote-access trojan attacks to control computers from wherever in the world they may be.

This is where things become much more sinister, because ratters who seek to view a camera's output have various motivations. Some are being voyeuristic, enjoying the thrill of being able to spy on their oblivious victims (they refer to those they watch and the computers they seize as 'slaves'). But there have been cases of ratters leaping into the even murkier world of sexual exploitation as they look to collect images and videos of people engaging in sex in front of their computers before using the captured footage to blackmail victims.

Unsuspecting children have been filmed by ratted webcams and threatened in such a way. Former Miss Teen USA Cassidy Wolf was watched for a year in 2013. The jailed attacker in this case was an ex-classmate who was found guilty of hacking the machines of up to 150 women. What's worse is that it's not difficult to do: a £30 device is pretty much all that is needed. Chillingly, a report entitled *Selling 'Slaving': Outlining the Principal Enablers from Pushing Malware and Put Your Privacy at Risk*, which was published in July 2015 by the Digital Citizens Alliance, said approximately 70% of all malware online today is made up of trojans.

"There's no question a camera cover is becoming increasingly essential," Adam Benson, a spokesman for the Digital Citizens Alliance, tells us. "But while covering your camera will prevent a hacker from using the camera to take new pictures, it doesn't stop a hacker from accessing the existing photos. It doesn't stop the hacker from key logging. It doesn't stop the hacker from getting access to your address book and getting control of a friend's camera. You are sticking one finger in the dam and plugging a hole, but others are popping up all over your computer. The camera cover is a first step, but far from the last one."

And yet the problems extends further than webcams. Security flaws in home automation devices are also being exploited to spy on people. The

Will Terms And Conditions Always Be Kept?

The short answer to this is 'no'. The terms and conditions of a service can and do change, so when you're alerted to an alteration, it's always worth reading what it entails.

WhatsApp, for instance, which has traditionally championed user privacy and battles against the authorities if they ask for data to be handed over, recently altered its policy. It will now share some user data with Facebook, allowing it to better target adverts. In a blog post, WhatsApp wrote, "by coordinating with Facebook, we'll be able to do things like track basic metrics about how often people use our services and better fight spam on WhatsApp."



WHATSAPP BLOG

Looking ahead for WhatsApp

Today, we're updating WhatsApp's terms and privacy policy for the first time in four years, as part of our plans to test ways for people to communicate with businesses in the months ahead. The updated documents also reflect that we've joined Facebook and that we've recently rolled out many new features, like end-to-end encryption, WhatsApp Calling, and messaging tools like WhatsApp for web and desktop. You can read the full documents [here](#). We're notifying everyone on the latest supported versions of our app about these updates, and you'll be asked to tap 'Agree' to accept the updated terms.

People use our app every day to keep in touch with the friends and loved ones who matter to them, and this isn't changing. But as we announced earlier this year, we want to explore ways for you to communicate with *businesses* that matter to you too, while still giving you an experience without third-party banner ads and spam. Whether it's hearing from your bank about a potentially fraudulent transaction, or getting notified by an airline about a delayed flight, many of us get this information elsewhere, including in text messages and phone calls. We want to test these features in the next several months, but need to update our terms and privacy policy to do so.



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popularity of wi-fi cameras means lots of footage is being transmitted over the internet and stored in the cloud. They're sending pictures via email when motion is detected, and they're listening out for noises. Since many of them are set up with a default configuration and password, many are proving easy to get into.

A mother in Houston, Texas was aghast when she went on Facebook and saw that a photo of her child's bedroom had been posted, gathering more than 600 likes. She found the security camera she had installed in the room had been hacked and made to live stream everything online. She told ABC News that one of her daughters had accidentally disclosed the name of an unprotected server while playing an online game, and that had allowed hackers to gain access to the camera.

"The social engineering techniques utilised by black hats is extraordinary," says Benson. "Regular citizens face two trying tasks: first, handling devices (including products connected through the Internet of Things) with more care, and second, avoiding the traps set in the physical world that hackers set to get control of digital devices."

Experts have been urging people to change their default passwords and shy away from systems that can be accessed remotely. The most secure way of owning a security camera is to have it connected to a monitor at home. IP cameras have an IP address, which means they can be easily hacked, whereas one connected to a digital video recorder affords no external way of breaking in.

"There is some good work being done within the cybersecurity community, but black hats have the upper hand right now," Benson continues. "It's not just about technology. We're still learning how to navigate through this increasingly complex world." This, he says, is a world of organised and disorganised crime: those who look to profit from selling or using stolen digital material and those looking to show what they can do – hackers, terrorists, state-backed hackers and inside threats.

Driving Us Crazy

This may wrack you with worry. What's being monitored? Who's watching? But it's looking to become a way of life. Not only are roadway sensors becoming increasingly sophisticated in being able to monitor traffic patterns and look for

Spying On Your Health?

In a bid to keep fit and healthy, many of us are buying fitness trackers, but according to a study, the information that we are allowing them to collect could be used for the benefit of others.

Andrew Hilt, Dr Christopher Parsons and Jeffrey Knockel say the collected info could be used by companies interested in mining and selling collected fitness data, whether that's to insurance companies, the authorities or the courts of law.

They also say criminals may be motivated to steal and access the data and that their Bluetooth capabilities mean they can track user locations. Many top brands appear to be particularly vulnerable to this because, unlike the Apple Watch, they don't periodically change their unique ID.

Some of the trackers are also failing to encrypt data before it's sent, allowing it to be intercepted and used by hackers.

▼ *Fisher-Price's Smart Toy Bear had a security flaw, but it was quickly rectified before it could be exploited by hackers*



accidents, they can be used to track single vehicles. Cars are also fitted with computer components that record and transmit navigation data. Smart-cars fitted with in-vehicle entertainment systems and mapping applications will certainly be able to track your movements.

Yet we willingly give up some of this data. When you take an Uber, a record of your travel is made. When you fly, your flight schedules and locations are logged. When you walk around with your mobile phone, it's possible to pinpoint where you are, thanks to tracking devices that are

blatantly included on the handset. Your calls, your data usage, the sites you visit, the Pokemon you catch and the texts you send are all trackable and build up a picture of you. In fact, upload your face to Facebook, and software can identify who you are.

Of course, face recognition software is becoming rather ubiquitous. Some home security cameras will scan your face and work out if you're supposed to be at home. They also learn your daily behaviour and get to know when you're usually coming and going, to alert you to



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anything suspicious. Even technology that isn't obviously serving a second purpose may be used for surveillance. The battery status API in HTML5 lets a device know how much juice is left, and it's used by some software developers to switch to a low-power version of sites and web apps.

Yet privacy researchers have found it can be used to spy on users. Security experts from Princeton University say the battery status indicator can be called on to 'fingerprint' a device and identify usage that is even being carried out via a VPN. Regardless of whether you're browsing privately, using a high-security firewall or blocking trackers, the battery status can be used in combination with other information gathering to say with a degree of confidence that it is being used across multiple contexts.

And there are seemingly no limits to what someone may want to discover about you. Two New Zealand researchers managed to grab the schematics for the We Vibe 4 Plus sex toy, which is controllable via a Bluetooth remote or a smartphone app, and they easily hacked it, thanks to its lack of certificate pinning. This allowed them to sneak a peek at the information it gathers and transmits, and that told them when the device was being used, which of the 10 vibration modes were being switched on and the temperature of the device. The security flaw has since been patched.

But even without the hackers' intervention, the fact that this information is being stored on the manufacturer's servers (and can be passed on to the authorities, according to the terms and conditions) must be very alarming for those who own one, even if the company says it uses the data for diagnostic purposes and to improve its products. A woman in Chicago is suing the company, accusing it of collecting intimate information which, it turns out, also includes the email addresses of customers. The lawsuit says Standard Innovation, the manufacturer of the device, obtained all this data with the permission of its users, and it's seeking the removal of the information from the Canadian servers. The company has declined to comment on this.

Future Worries

So what of the future? Well, it's likely the number of devices that track our usage or put us under surveillance is only going to rise. Artificial intelligence will look to gather intelligence on your habits and

Buying Surveillance Tools

If you have \$650,000 in your back pocket, then you could hand it over to the NSO Group in Israel in exchange for surveillance tools that will capture keystrokes, sounds, messages and locations of other people. You'll have to stump up a \$500,000 setup fee as well, but for some, this is entirely worth it for the information it can turn up.

NSO Group is one of a number of companies selling digital spying tools, and it does so under the statement of "make the world a safe place". Realistically, even if you did have that kind of money to spare, it won't sell to you – but that's only because it targets its products squarely at governments and law enforcement agencies.

According to Bill Marczak, a senior fellow at the Citizen Lab at the University of Tokyo's Munk School of Global Affairs, "once NSO's systems are sold, government's can essentially use them however they want."

He told the New York Times, "NSO can say they're trying to make the world a safer place, but they are also making the world a more surveilled place."



“ Technology vendors need to consider security from the outset ”

make predictions about your personality and your behaviour, and apps will continue to surface that take advantage of the tech you carry around with you at all times.

It's been said that the precise gyroscopes in smartphones are accurate enough to pick up vibrations caused by sound and that this could be used with speech recognition algorithms to spy on you.

Four years ago, the CIA director David Petraeus warned that spies would be able to bug our homes via our appliances, and we're seeing chips of the technological kind in our fridges, our washing machines and our televisions.

Indeed, Vizio smart televisions were called out last December for tracking users' viewing habits and sharing that information with third parties. It said the

feature was automatically switched on in more than 10 million sets, and that it analyses parts of what you watched and linked that to your IP address. This was most likely being handed to third parties for advertising purposes, but Vizio is by no means the only company doing this. Samsung has also been criticised for capturing voice commands, text and other usage data, and LG is able to track viewing data too.

All these features can be turned off to make your television more secure, but the fact they're on by default means many people feel – whether rightly or wrongly – that they're giving away information they perhaps wish they weren't. But from hackers to legitimate companies, it appears everyone wants a piece of us. The question is, how much are you willing to let them have? **mm**

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HOW TO RECORD ANYTHING

Turn your PC into a personal video recorder
and record TV, games playing, software demos
and more. Roland Waddilove provides the tips
and techniques

PCs can be used in many ways, and for over a decade they've been able to record television programmes. Media centre PCs from a decade ago were very popular, and while the media centre PC has gone, there are USB sticks and plug-in expansion cards that enable you to relive those multimedia PC days. We'll take a look at some modern options for recording and watching TV on your computer.

Gaming is huge on PC, and perhaps the second most popular activity after playing games is watching people play games. You might want to record your own game playing skills, and we'll examine some of the ways you can record the action in games.

If you want to create demonstrations of software, tutorials, guides, online courses and so on, you'll need to be able to record your actions on your computer screen. There are several utilities that enable you to record whatever appears on your screen and to add your own narration over the top. We'll see how to do this too.

The Rise And Fall Of The PVR PC

Back in the early 2000s, PCs would often be supplied with television tuners built in. They came with a special version of Windows XP called Media Center Edition, which, along with the TV tuner card, enabled you to watch live TV and to record it. All you needed to do

was to plug a TV aerial into the back of your PC and run Media Center. It was your personal video recorder (PVR).

Windows Media Center turned your computer into a home entertainment system. It could play music from your music library, show slideshows of photos you had transferred from your camera, and it was a TV recorder and player. Media Center had an electronic programming guide (EPG), which enabled you to browse the television channels and see what programmes were coming up on TV over the next week.

It was similar to Freeview digital TV and Sky+ menu systems today. Programmes could be scheduled to record

and, provided your computer was switched on, it would record them and save them to the disk so you could watch them later. It was a useful personal video recorder, especially if it was in a room other than the lounge where your main TV was.

Today, it's hard to find a PC with a TV tuner built in, and many of the companies and products that were around ten years ago have disappeared. The reason for the decline of the PVR and media centre PCs is the rise of streaming television and movies. Netflix and Amazon Video provide thousands of movies and access to complete television series. They don't show much that is less than six months old, which is a shame,



▲ This media centre PC's analogue TV tuner stopped working when TV became digital



▲ This WinTV-SoloHD USB stick from Hauppauge enables you to watch and record TV



▲ The Hauppauge WinTV-quadHD enables you to watch and record four TV channels at once



▲ The WinTV software bundled with Hauppauge TV tuners can record multiple channels



but there are plenty of catch-up TV services for that.

With BBC iPlayer, ITV Player, Channel 4, Channel 5, Sky Go Player and Virgin Media On Demand you have access to almost everything that has been on TV recently, and there's rarely

any need to record television broadcasts on your PC. Open a web browser, and all it takes is a few mouse clicks to display your favourite catch-up TV services.

Hauppauge (**hauppauge.co.uk**) has been around since the days of the Windows XP

Media Center PC and is still producing TV tuners. In fact, the range looks bigger today than it ever did. There are dozens of products to choose from if you want to turn your modern PC into a PVR and watch and save digital and satellite TV programmes. Here are just a few gadgets from a wide range on offer.

The WinTV-SoloHD is a small USB stick that plugs into any PC or laptop with a spare socket, and it costs £40. It's capable of receiving standard and HD

Freeview TV and also free-to-view digital cable services. The TV stick works with Windows 10, 8 and 7, and there's even support for Linux (**linuxtv.org** is a useful resource for Linux users wanting to watch and record TV).

WinTV v8 software (**bit.ly/28X5tSG**) is bundled with the TV tuner, which enables you to watch live television and to record broadcasts in the original quality. It has a TV recording scheduler, you can pause live TV, and it supports viewing multiple channels at once on TV tuners that support it. A new feature in the beta of the next version is support for recording quad-mode picture-in-picture.

Hauppauge has a couple of USB dongles that are able to receive and display satellite TV on your PC. All you need is a satellite dish pointing in the direction of a suitable FreeSat satellite. You can also watch free channels from Astra and Eutelsat satellites. Your PCTV 461e satellite TV receiver costs £57 and the WinTV-NOVA-HD-USB2 costs £66. The latter comes with an infra-red remote control and WinTV v7 software, and it enables you to record digital satellite TV programmes to disk in the original MPEG-2 quality or the original HD format. The scheduler in the software enables you to look ahead and mark programmes to be recorded, just like with the TV and satellite box in your lounge. Recorded programmes are saved to your PC's disk drive.

The company also has a range of internal TV cards for people with standard desktop PCs as opposed to laptops. For example, there's the crazy WinTV-quadHD which has four DVB-T2, DVB-T and DVB-C tuners on a half-height board. The quadHD in the name does not refer to the resolution, but the board's ability to watch or record four Freeview standard, HD or digital cable TV programmes at once. This is what the quad picture-in-

“ Many of the companies and products that were around ten years ago have disappeared ”



▲ With the right add-ons and hardware, Kodi can display and record TV, play music and more



▲ Plex is available on everythingm and it allows any device on the network to access it



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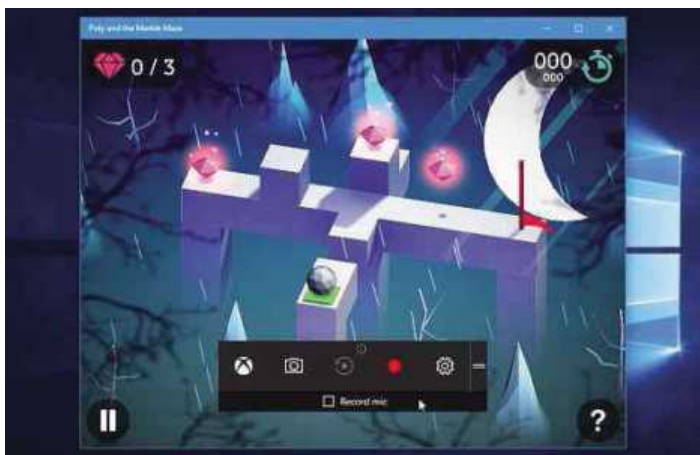
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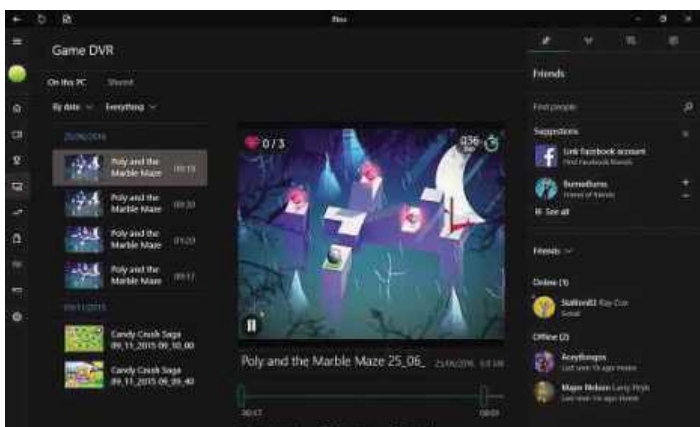
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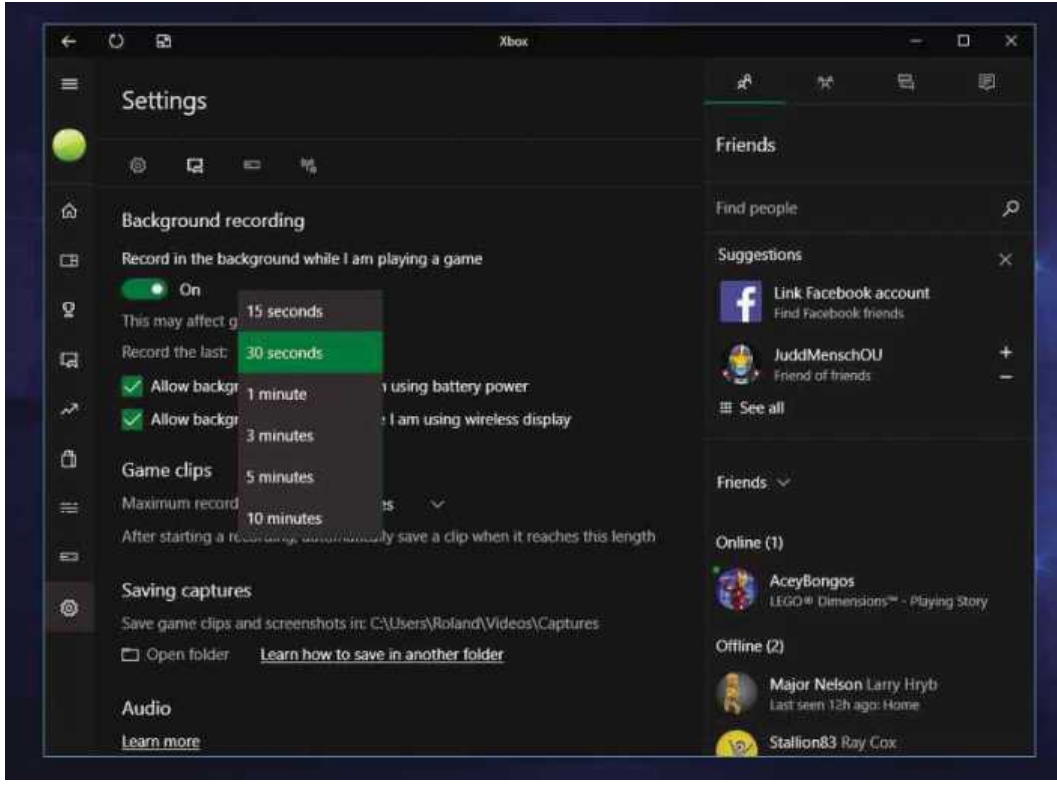
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▲ Press Windows+G when playing a game to open the Game Bar and record the action



▲ Open the Xbox app to browse your game recordings and to edit them



▲ Go to Xbox settings to customise the background recording, resolution and quality

picture feature in WinTV v8 was designed for. It can record HD video at 1080p using MPEG-4, and it costs £99. It's expensive, but nice if you can afford it.

Media Center Alternatives

The old Microsoft Media Center software is no longer available, but there are alternatives if you want a program that can replace it. One example is Kodi (kodi.tv), which is a free, open-source program that does pretty much everything that Media Center used to do. It not only enables you to select and play videos on your PC, it interfaces with some common TV tuners and provides recording facilities too.

Go to the Downloads section of the website and you can get Kodi for almost everything, including Windows, Linux and even Raspberry Pi. There are many add-ons and extensions that provide extra features, like the ability to access online streaming content.

Plex (www.plex.tv) is another Media Center

replacement and it's one of the best. It creates a media server that is accessible from other computers, phones and tablets on your home network. It supports Xbox, PlayStation, Amazon Fire TV, Apple TV, Android TV and more. It's more of a streaming media server than a recorder, though. There's a free and a premium version, so experiment with the freebie first to get the hang of it and upgrade if you want more features.

Record PC Games With Xbox

Gaming on the PC is huge, with even more players than Xbox and PlayStation. The next best thing to playing games on PC is watching them, and websites like Twitch (twitch.tv) have millions of members that love to watch experts play games on their computers. YouTube also has a special gaming section (games.youtube.com) that features live streaming of games, recorded action like walkthroughs of games, and a large number of channels by gaming experts.

A few years ago, you would probably not have guessed how big watching games would become today, but there's massive interest in it. This is probably the reason why Microsoft has built a video recorder into Windows 10 that's designed to enable you to record your gaming activities. You can record the action to video, take screenshots, save them, share them with others and post them online.

There are some limitations, and it's not perfect, but the recorder is easy to use, and it mostly does a good job. One of the limitations of the recorder is that it's designed to work with modern apps from the Windows Store. Not all games are in the store, and the recorder isn't designed to work with traditional software, but for Store apps it's great.

The digital video recorder is part of the Xbox app that's





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“ Hauppauge has a couple of USB dongles that are able to receive and display satellite TV on your PC ”

bundled with Windows 10, but the app doesn't need to be running in order to record the screen. You start the game you want to record, which should be an app downloaded from the Windows Store, and press Windows+G to display the Game Bar. This is a toolbar that has buttons to take a screenshot, record the action in the background or begin recording. Click the red record button and then continue playing the game. Display the Game Bar again and click the button to stop recording.

Videos are saved automatically to disk, and you don't have to worry about filenames or locations. The videos are saved as standard .mp4 files in your personal Videos folder in the Captures subfolder. The filename includes the name of the game and the date and time. They can be played in the usual way by double-clicking them, but if you don't have a video player, you could use VLC media player (videolan.org).

The Xbox app can be used to browse the video recordings and even to perform simple editing like trimming the start and end

of a clip. Open the Xbox app and select the Game DVR icon on the left. The video clips are listed, and selecting one opens it in the video player. You can watch it, and if you want to make changes to it, click the Trim button below the viewer. Drag the bars at the left and right sides to trim the start and end of the clip. There's an option to overwrite the original clip with the trimmed one or to save it as a new file.

There are some useful configuration settings that enable you to set the quality of the recording and other factors. Click the gear icon in the Xbox app and select the Game DVR tab at the top. There's an On/Off switch at the top, so if you haven't been able to get the Game Bar on the screen to start a recording, it may be switched off.

Keyboard shortcuts can be used to start and stop recording. This bypasses the Game bar, which might not appear in some

full-screen games. The default shortcuts are shown, but there's an option to define your own. Press Windows+Alt+R to start and stop video recording. The game audio is automatically recorded, but if you want to also record a commentary as you're playing, press Windows+Alt+M to turn the microphone on and off.

If you've just done something amazing in a game, such as killing the boss character at the end of a level, press Windows+Alt+G to activate the Record That function. This saves the last 30 seconds of the game as a video recording. Some games take a long time to complete, and there's an option to record in the background while playing. Turn this on and set the maximum recording time to 30 minutes, one hour or two hours as required. Videos are automatically saved when the time is up.

Scroll right down to the bottom of the settings, and

you'll find audio and video quality options. Audio can be set to 96Kbps (low quality) to 192Kbps (high quality). Video quality can be one of three settings, Standard, High or Very High. The video resolution can be Standard or High.

Needless to say, selecting the highest quality for the audio and video will result in larger video clips. But the main problem isn't that; it's the impact on the game. A low-powered PC might be struggling to play the game at a decent speed anyway. Add the overhead of recording high-quality video and audio at the same time, and the game could become unbearably slow or jerky.

Experiment with these settings and see how your PC copes with low-, medium- and high-quality recordings. If you have a good gaming PC, then you might not notice any difference when recording, but some people will be affected, so try it out.

Use A PVR For Windows Games

There are several potential problems with the Xbox DVR, and one is that it might slow down your computer, because in addition to running the game, it's also capturing video. It's trying to do two things at once. Another is that it's designed only for Windows 10 modern apps – games from the Windows Store.

An alternative solution and one that's much more flexible is the HD PVR Rocket from Hauppauge. This is a small USB-powered gadget that records video from your PC's HDMI (without HDCP protection) or component video. In fact, because it records the video output directly rather than running

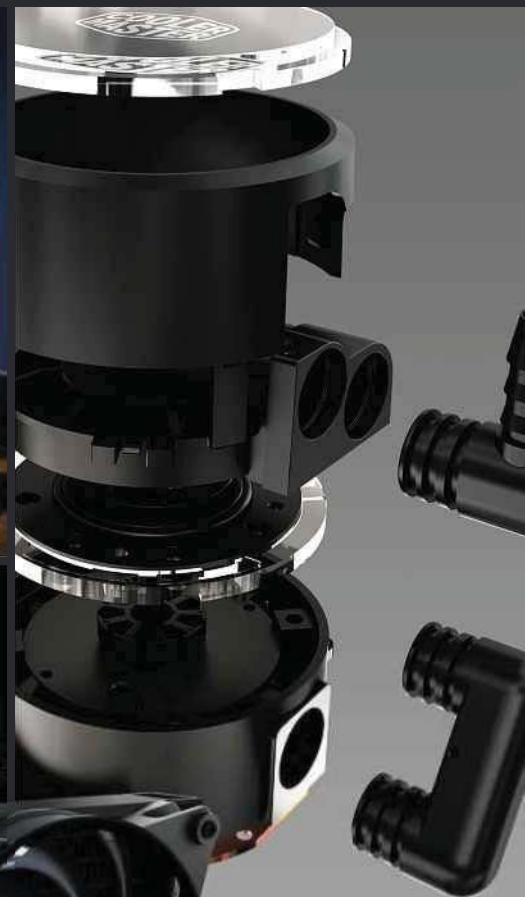


▲ The Hauppauge HD PVR Rocket plugs into your computer and records your gameplay





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on your PC, it can also record the output from Xbox One, Xbox 360, PS3 and PS4. This is a handy gadget for recording your gaming activities.

The HD PVR Rocket has a microphone socket so you can record gameplay commentary. You plug in a USB flash drive to provide the storage for video recordings, and there are HDMI in and out sockets and AV in. It's able to record in HD resolution, and you can stream with Twitch and YouTube. The HD PVR Rocket costs £115.

Record The Screen

If you want to create tutorials for software, guides to using the web or applications, or create training courses on your PC, you'll want to capture the screen. Your activities are saved as a video file, which can then be posted on the web, shared using YouTube and other services, or compiled into courses. There are several

utilities for screen capturing, and some of them are free.

Jing (techsmith.com/jing.html) is a free utility that enables you to capture the screen and save it as a video, which can then be shared or saved to disk. It's intended for creating short tutorials, such as how to use software and websites, how to perform various actions and fix problems in Windows and so on. However, it can be used to record anything that appears on the screen, so if you have something you want to capture, try Jing.

When the program is run, it adds a small orange/yellow circle at the top of the screen. When the mouse hovers over it, three controls appear, and the left one is used to select the area of the screen you're interested in, such as a program window. A toolbar appears below the window, and there are screenshot and video recording buttons. Click the

record button and everything in the selected area is captured.

When you've finished, the video can be saved using Jing to the screencast.com website, and 2GB of space is provided with a free account. Videos can be shared from there, but you can also save the video to disk as a .swf file. The best player for this is Chrome. Just drag the video from a Finder window and drop it in Chrome's address box.

Screencast-O-Matic (screencast-o-matic.com) is an unusual screen recorder that works within a web browser. It may or may not need a download first. This depends on your computer, but it runs a check and then provides a file to install if you need it.

You can then visit the home page of the website and click the Start Recording button. A rectangle appears to mark the recording area, which can be moved and resized as required. Click the record button in the

toolbar at the bottom, then anything that appears within the rectangle is recorded. Any application or even a video will record if it's in the rectangle. The free version of Screencast-O-Matic records up to 15 minutes of video, which can be saved to disk as a standard .mp4 file that can be played in any video player.

The Pro version costs \$15 a year, and it allows any length of recording and provides things like editing tools, draw and zoom, and other useful extras. The free version doesn't record audio from applications, but it does record from the microphone. This is to enable you to add voice-over narration, such as when demonstrating software, recording games and so on. However, with the speakers turned up, the audio from applications is recorded via the microphone. It's poor quality, though, so get the Pro version to get high-quality audio. If you need to record the screen, the Screencast-O-Matic web app is an interesting option.

CamStudio (camstudio.org) is an open-source project that enables you to record your screen and save it as a video. Whereas Jing and Screencast-O-Matic are mostly automatic and have few controls, CamStudio has a large range of configuration options and settings. You can record a fixed area, the area to be recorded can be selected with the mouse, or a window can be recorded. An auto-panning feature enables a small area of the screen to be recorded, but it's centred on the mouse, which it follows. This can be very useful for keeping the size of screen recordings to a minimum.

The video compression settings can be tweaked, there are options to record from the speakers or the microphone. Annotations can be created, and recording can be manually or automatically stopped, to name just a few features. mm

“ There are several potential problems with the Xbox DVR ”



▲ Use the Screencast-O-Matic website to create a recording of whatever is on your PC's screen



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Why Brands Need To Worry About Facebook (Again)

Facebook has made another change brands won't like... but how will it affect normal users? Sarah Dobbs checks it out

Stick a pin in the calendar and you're virtually guaranteed to hit a day when Facebook's changed something and upset a certain group of people. It seems like there's always a reason to be annoyed with the site's changes, either because they mean you need to go trawling through your privacy settings to make sure all your photos haven't suddenly become visible to anyone and everyone, or because they mean you only get to see your friends' posts according to Facebook's apparently inexplicable whim rather than in chronological order.

So you won't be surprised to hear that something else has changed, and again, people are somewhat upset about what that means to the way they use the social network. This time, though, it's not your friends and family members who'll be most aggravated. Okay, it might be your friends and family who're glaring in Facebook's general direction if they happen to have jobs that involve managing brand Facebook pages, but it's more likely to be your favourite band, or your local pub, or that TV show you like seeing posts from.

Yup, the most recent tweak to Facebook's News Feed algorithm affects brands – most seriously, publishers and news outlets that increasingly rely on the site for click-throughs but also pages for things other than Facebook profiles of people. If you do know some social media managers, they might be looking a bit stressed round about now.

So what's changed? And how does it affect you and your everyday Facebook browsing? Let's see.

A Better News Feed?

Facebook appears to be pretty pleased with itself for implementing this new change. Indeed, the company's VP of product management, Adam Mosseri, wrote a press release all about it back at the end of June. Its title was the less-than-apologetic 'Building A Better News Feed For You' (you can read it in its entirety here at tinyurl.com/jz2gfjq) and the gist of it was that, although it doesn't want to dictate what kinds of stories people do and don't see online, Facebook has to make some decisions about what kind of content is displayed first in users' News Feeds. The result of this fact, he explains, is that after thinking about it the firm's engineers decided that people generally want to see posts by their friends and family first.

It sounds fairly obvious, put like that. After all, the reason most of us use Facebook in the first place is to stay connected with people we don't get to see every day. Facebook lets us share photos and ask questions and tell people about life events, or even just share silly things we've read or spotted or thought.

If that kind of stuff – sharing posts and checking out what our friends have come across – is the whole reason we log in, it doesn't seem outrageous for Facebook to say, well, those are the kinds of posts we're going to prioritise from now on. It would appear, on the surface, to mean that when you scroll through the latest posts, you're a lot more likely to see stuff from people you know.

There's a 'but' coming, though. There's always a but, isn't there?



▲ Facebook HQ seems to be forever making changes that make their users see red



▲ Posters inside Facebook's campus describe their mission... Does that really sound like a good idea?

Better By Whose Standards?

Here's the 'but': over the decade that Facebook has been available to the general public, it's changed from being a little network where everyone knows everyone to a gigantic world-spanning media empire. For a lot of people, it's the first website we look at when we wake up, and the last one we check before going to bed – and in between, you probably have a tab open on your computer for most of the day, or else you've got the app loaded on your phone so you can have a sneaky peek whenever the mood takes you. It's got a massive amount of influence, and it's also a platform almost every brand in the world now uses to communicate with their audiences.

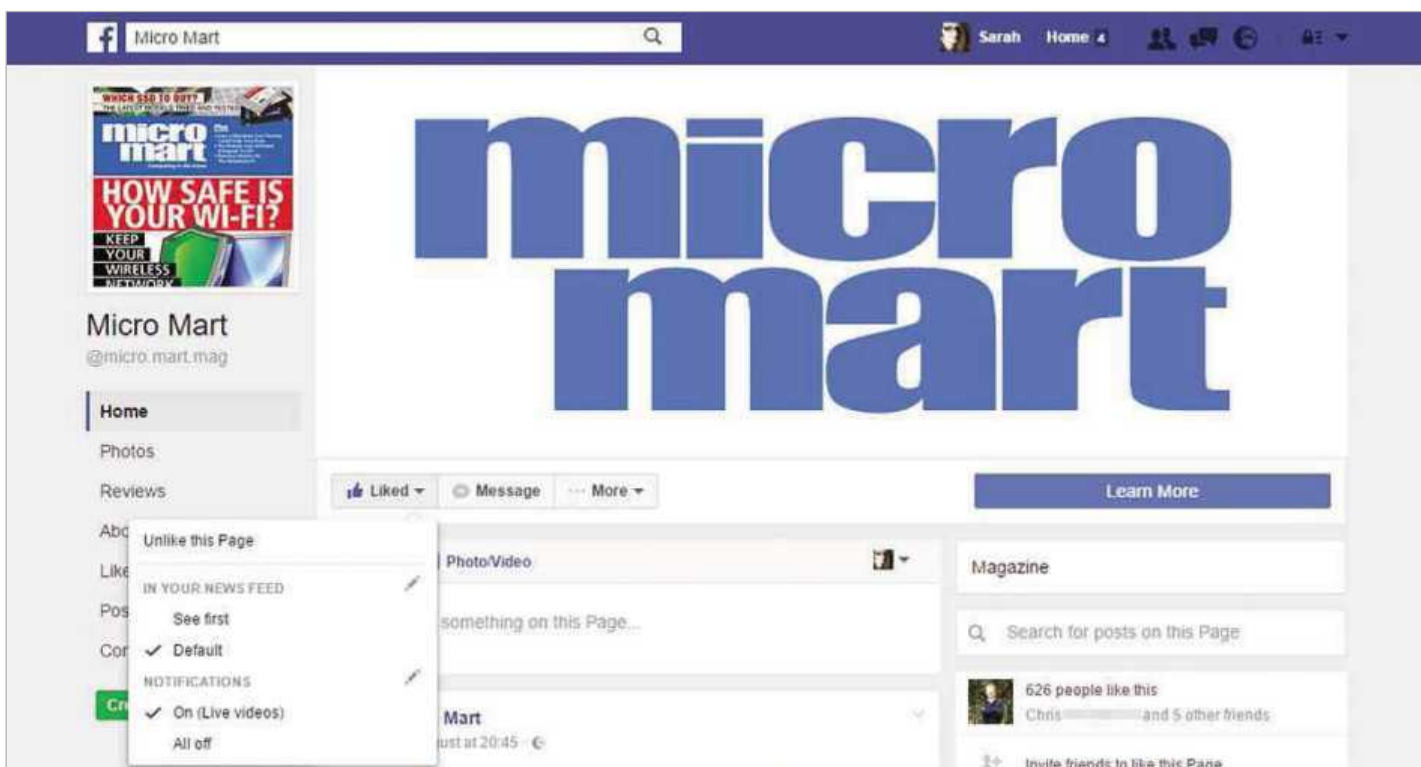
Recent surveys show that around 62% of adults in the US say social media (meaning primarily Facebook and Twitter) is their main source of news. Think of a recent news story and chances are, you first read about it on Facebook or Twitter. We're not just using these sites to talk about our kids, pets and haircuts – we're using them to share world news and discuss important things that are going on in

the world. To stay informed, you might follow BBC Breaking News on Twitter or Like the page of your newspaper of choice, expecting to see their posts appear in your News Feed as and when there's something you need to know about.

Facebook, however, just decided those kinds of things are low priority and people aren't really interested after all.

Tell Me More

The thing is, it's not like Facebook doesn't understand its users. It's not like no-one at Facebook knows how important it is to brands for their posts to appear in front of their fans' eyes; it's not like Facebook doesn't know how many of us expect to see updates from, say, musicians we like, or shops we've followed in our News Feeds. This decision isn't really about making sure you see your aunt's latest post about her cat before you find out when the Christmas episode of *Doctor Who* is set to air. It's about the same thing every Facebook update is about: money.



▲ You can choose which Pages you want to hear more from, though the decision is ultimately up to Facebook



▲ Seeing more of your friends' content might mean seeing more sponsored posts from things they like

This change to the algorithm will mean that anyone who manages a Page on Facebook will see their posts' reach decrease. That's a problem a lot of social media managers will already have noticed. Social media optimisation company SocialFlow has already reported many publishers had seen their Facebook engagement drop by up to 42% by the beginning of June, and the odds are it's only going to get worse from here on in.

So what can brands do about it? When the algorithm change was announced, Facebook assured brands that if their content is widely shared by their customers and fans, then they wouldn't see much of a drop in reach – the whole point is that the algorithm is meant to highlight the content your friends and family are posting and sharing, and if that happens to include posts shared from Pages, then you'll still see them and everything will be fine. Except, of course, fewer people will see those posts in the first place so they'll be less likely to share them.

So instead, brands will have to consider paying Facebook to show their content to more people. Exactly how much that costs depends on how many people already follow a Page's content, but brands can bag themselves a few thousand more eyes for a couple of quid a pop. Those 'boosted' posts will then show up in users' News Feeds as promoted content.

Alternatively, brands could buy Facebook adverts, which again vary in price depending on how many people you want to reach. Either way, this new algorithm change means that if brands want to reach as many people as they used to, they'll need to fork out some cash for the privilege – and they'll need to do that for every single post they want to promote. Suddenly, using Facebook to promote your business – whether that's some sort of mega-brand like Tesco, or the local family-owned restaurant at the end of your street – just got a lot trickier and much pricier. Especially when you consider that, with more demand for adverts and promoted posts, Facebook will no doubt be hoping that it's able to bump its prices up in the near future.

When Algorithms Go Bad

You know, that little box on the right hand side of your News Feed that displays key words relating to popular stories people are talking about on Facebook? It's entirely possible you've never really paid much attention to it, but it's a similar kind of concept to Twitter's trending topics – and Facebook hasn't just been tinkering with its News Feed algorithms. It's also been changing the way its Trending feature works.

It used to be that the stories displayed in that box were selected by human employees of Facebook. The social networking site employed people to comb through the list of keywords that Facebook's algorithms had detected were being discussed widely on the site, then pick out specific stories, write a headline and a summary, and the news snippet would then appear in the Trending box.

Recently, a few news organisations (including *Gizmodo* and *The Guardian*) reported on how that process worked, highlighting some problems with it. *Gizmodo's* reports had whistleblowing contractors claiming that certain types of political news were deliberately suppressed, while *The Guardian's* source described a toxic working environment where employees were discouraged from reporting problems and found themselves frequently scrambling to keep up with changes that Facebook's engineers had made to the platform (sounds familiar).

Apparently in response to all that bad press, Facebook made its team of editors redundant and instead set up an algorithm to generate the stories and display keywords to users all by itself, without human intervention. That decision went about as well as you'd expect, meaning within days of removing human eyes from the process, the Trending box had displayed inaccurate and potentially libellous stories about people and also promoted some, er, let's say... 'x-rated' content to thousands of users.

Still, Facebook seems determined to continue to use its automated method of choosing and displaying stories – a spokesperson told *The Guardian* that the algorithm was always learning from what the human editors prioritised and was always intended to take over. Let's hope it's a quick learner, though, because as it is, that Trending box is almost always displaying inane nonsense based on what a couple of thousand users – barely a relevant percentage of Facebook's active users, after all – are talking about.

As a print magazine, you'd probably expect us to say this, but sometimes, it's worth employing people to filter and report the news for you with some degree of judgement and skill. Isn't it?





▲ Paid-for suggested posts won't be going away any time soon

Knowing You

It's not quite that simple, though. The other thing Facebook is promoting with this new algorithm change is that the News Feed is customisable – that is, that users can decide what kind of content they want to see and that the algorithm will learn to show them ever more tailored feeds by monitoring behaviour on the site.

If you trust Facebook to have your best interests at heart, that might be a great thing. Facebook's changes over the last year or so let you set various preferences for the people, Pages and adverts that you see on the site, as well as using its algorithms to analyse things like the kinds of content you regularly click Like on, so you can teach Facebook to show you mostly stuff you want to see. If you want to see posts from a Page, for instance, you can go to the Page and hover over the Like button. There, you'll be able to see options so that you see their posts first, not at all, or just by the Facebook default.

If you're seeing a lot of posts you don't want to see, you can hide those from your News Feed by clicking the arrow in the top right-hand corner of a post and choosing to either hide the post (and, in the process, tell Facebook you want to see fewer like it) or to unfollow the person or Page who posted it (which will mean you won't see their posts, but you'll still be friends with the person/Like the page).

Doing all that can definitely restore a sense that you're in charge of what you're seeing on Facebook, but it's also doing something else – telling Facebook what you like, how you use the service and what kinds of posts you're most likely to respond to. This kind of behavioural tracking might seem pretty harmless, but in the end, it's just helping Facebook work out how to advertise things to you most effectively. See, in the end, it really does all come back to money.

So What Will I See?

You might not be overly bothered, of course, and most of us will continue to use Facebook regularly because, at the moment, its usefulness outweighs its annoyances. There's nothing we can really do about any of the changes, so the main thing you probably want to know is what this actually means about the posts you'll see when you log on.

Well, you may already have noticed some changes, as this algorithm has already been rolled out and is now in the process of sorting out who sees what. The main difference should be that you now see more posts from your friends and family and less from Pages and brands. You may also have seen an improvement in Facebook's ability to judge exactly which friends you want to hear from – so, you should see more from family members whose jokes you reply to, and from that friend whose selfies you tend to like, but less from that guy you went to school with and never really interact with anymore.

As the drop in traffic to Pages starts to sting, though, you might see a bit of an increase in promoted posts and ads as social media managers are forced to splash cash to get your attention. These posts may be from brands you actually like as well as ones you've never heard of; posts you might have wanted to see anyway may now be paid for. In time, though, you might realise you're seeing more posts from bigger brands and less from smaller ones, as indie designers or bands are likely to have less budget to spend on Facebook promo.

As time goes on, it's likely that the types of content you see on Facebook shifts too. Many publishers have already changed the way they write headlines to make their content seem more clickable and shareable, and that's only going to get worse. Until recently, Facebook prioritised native content (i.e. articles published directly to Facebook and videos hosted on the site rather than links through to other websites) but this latest change will affect those too. Some publishers might actually stop bothering with Facebook as a native hosting platform, as it makes less sense if fewer people will see it, and it's eating into ad revenue as well as charging for eyeballs.

Interesting Times

Some non-media brands will also reduce the amount they post on Facebook, or even stop posting there entirely. Probably not just yet, though, since it's still an important platform. It's possible, however, that changes like this will eventually diminish its value to brands. If that happens, well, that'll be an interesting time for the online ecosystem but, for now, you can carry on Liking and sharing as before... keep an eye on your News Feed, though and ways it changes. Facebook's relationship with its users and advertisers is a complicated one, and someday, the balance of power will shift, one way or another. **mm**

Uh Oh, Now Everyone's Angry With Twitter

As this article was being written, Twitter announced a big change to its service that got loads of people up in arms. Nope, the abuse-blocking tool hasn't been rolled out, and you still can't edit your tweets, but now Direct Messages on the platform have become, in Twitter's words, "more dynamic."

In real terms, that means Twitter has added read receipts to DMs, as well as including typing indicators so you can see when the person you're talking to is composing a message and link previews, so you can see before you click what you're being directed to.

In a nutshell? Twitter's tried to turn its own direct messaging feature into a cross between Facebook Messenger and WhatsApp. Predictably, the immediate reaction from Twitter users was outrage, because basically everyone hates read receipts and typing indicators, and the whole thing feels like a slightly useless 'upgrade' that no-one asked for or wanted.

If you tweet and don't want to see this, you can click into your security settings and uncheck the Send/Receive Read Receipts box. For now, anyway.

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Component Watch

If you're not ready to give up on optical media just yet, here are a selection of great Blu-ray player and writer deals

As impressive as streaming video is, it just doesn't capture that high-definition quality that makes modern movies look so stunning. Luckily, Blu-ray discs offer HD visuals at affordable prices. And whether you've got your own media centre PC or just want to watch the occasional movie on your desktop (or laptop) we've picked out the best Blu-ray drives around, and found the best prices available for them.

Deal 1: Samsung SN-506BB
RRP: £65 / Deal Price: £41

This slimline internal Blu-ray ready drive is fully compatible with both Mac and PC hardware, as long as you've got space for it inside your laptop.



It's quite expensive, but as optical drives fall out of favour in portable computers it's fair to say you don't have a lot of options at this kind of form factor – and of the few that do exist, this is as good as they get thanks to the Samsung seal of quality. If we're honest, we'd probably tell you that an external drive would be a much smarter way of getting access to this technology and saving a bit of money. However, if are sure you want to go with an internal one, this is your best bet.

Where to get it: BT Shop (bit.ly/2dbS7TS)

Deal 2: Asus BC-12D2HT
RRP: £55 / Deal Price: £50

This full-size internal Blu-ray drive is also super-cheap, but there's a good reason for that: the disc writing speed is comparatively slow. Whereas most drives you'll come across can manage 6x without breaking a sweat, the best you'll get out of this low-end drive is a measly 2x. If you prefer to save yourself 11 quid compared to the price of the Samsung model we'll get to next rather than have that speed available to you, that's fine – maybe you don't write a lot of discs anyway. However, if you're after a drive that can handle playback and writing with equal aplomb, you might want to give this one a wide berth and read on.



Where to get it: Currys (bit.ly/1Pk5eRR)

Deal 3: Samsung SE-506CB
RRP: £65 / Deal Price: £61

You probably won't find a cheaper external Blu-ray drive than this. What's more, while it's comparable in cost to the average stand-alone drive, this one does disc writing and has A/V connectivity – so it's essentially a stand-alone player as well (though it does rely on your TV accepting USB in order to work). Whatever, it's slim, lightweight, and powerful – a tough combination to turn down, if you're looking for an external drive that can go on the move with you.



Where to get it: CCL online (bit.ly/2cTtiOV)

Deal 4: Pioneer BDR-S09XLT
RRP: £70 / Deal Price: £63

This internal SATA drive has wide support for disc formats, as well as built-in disc encryption, password protection and M-DISC support, which stores data in a robust and near-indestructible way. It has energy-saving low power features that ensure it won't be much of a drain on your system, and is as silent as these drives come. Price aside there's nothing here we wouldn't recommend, but that 10% off is handy.



Where to get it: Scan (bit.ly/2d6B4GY)

Deal 5: Asus SBW-06D2X
RRP: £80 / Deal Price: £75

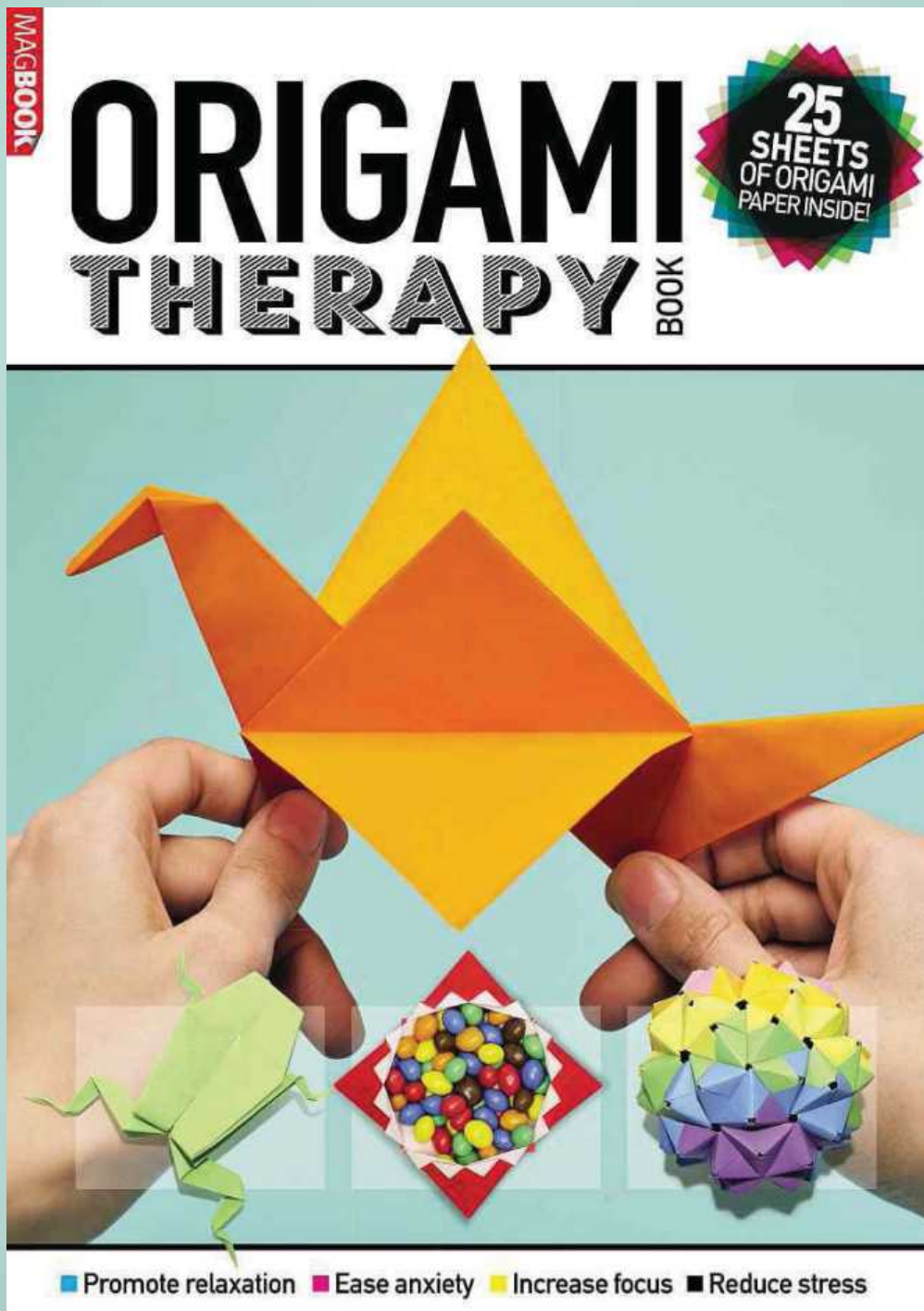
Asus's external Blu-ray writer is impressive on every level. Not only does it look great (slim and glossy, with a rakishly angled stand), it's also got impressive features such as Auto Tuning Power technology and double-strength disc encryption with password controls. It even has BD-XL support, for writing discs that can hold up to 128GB. We can't think of any finer external Blu-ray writer to buy if you're looking for one.



Where to get it: Novatech (bit.ly/2cNH1td)

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PlayKey Launches In UK

Cloud gaming service promises blockbuster titles

Is There An Echo In Here?

Amazon brings voice-controlled device to UK

Following its success in the States, Amazon has announced that the Echo voice-controlled speaker is to ship in the UK within weeks.

The Echo speaker will launch on 28th September for £149.99. The Echo Dot, meanwhile, will arrive on 20th October. This is a smaller, cheaper device (costing £49.99), which is primarily designed to be dotted around the home and used as a voice assistant to control smart devices. Both use Alexa, Amazon's own virtual assistant that acts as the brains of the operation with its functionality including answering questions about the news and weather, playing music, checking your calendar, setting timers and alarms, creating shopping lists, controlling lights around the home and more.

Echo has had some rave reviews across the pond and is very likely to bring the voice-activated, smart home into the mainstream. Echo is entirely hands-free and adopts far-field voice control, promising access to Alexa's many powers from

anywhere in a room. It also looks pretty marvellous, with its cylindrical light beam providing visual feedback when you talk to it. Echo Dot also comes with a built-in speaker, although it's not especially powerful as a music player, so it's handy that it can be directly connected to other home speakers, adding voice control to your home stereo system.

In all honesty, there isn't a whole lot not to like with these devices. Is it Christmas yet?



Tetris Goes Super Size

Israel plays massive game of retro classic

It's always nice to see *Tetris* being played somewhere. Better still when that somewhere is on the side of an actual building.

In Tel Aviv, as part of the city's innovation festival, the City Hall building was turned into a playable game of *Tetris* as the building's side was kitted out with a 32,000 square foot screen made up of 480 LED lights. In order to play such a super-sized

game, two 5ft-tall joysticks were then placed nearby, and onlookers were actively encouraged to have a go.

It wasn't just *Tetris* either. *Snake* and *Pong* were also played on the building, with the project running until the end of the month. You may recall that this kind of thing has been done before, with *Tetris* also finding its way to a high rise building in Philadelphia in 2014.



PlayKey, a cloud gaming service from Russia, has now launched in the UK, with the promise of more than 20 triple-A titles to choose from.

Delivering “top quality” video streaming through the company’s gaming servers, PlayKey enables UK gamers to play best-selling titles on “virtually any PC, Mac or



laptop”, citing *The Witcher3: Wild Hunt* and *Fallout 4* as examples. PlayKey says that there are games to suit all, however.

There are various subscription options available, starting from just 90p for one hour and £9

for a month of access. A launch demo period is available for free and all games are available “as is” with all specific features, including multiplayer, social features and achievements.

Read more at www.playkey.net.



At a recent music festival on the UK’s sunny south coast, as I was watching a band that I’m apparently too old to have actually heard of, I noticed a light hovering overhead in the night sky. What was this strange, unidentified flying object, and how was it floating so perfectly still above the stage?

As my eyes adjusted to the darkness, I realised it was a drone – and obviously a far more advanced model than I’d seen before. Who was flying it, I’ll never know, but it was fascinating to watch. Indeed, it was significantly more entertaining than the music.

But as interesting as it was, I couldn’t help but feel concerned about the drone’s presence. After all, it was flying above a densely populated field, and should it have crashed, numerous people, including young children, could potentially have been injured.

Whoever the pilot was on this occasion, he or she was breaking the law, which states that you can’t fly a drone within 150 metres of any congested area. Unfortunately, this illustrates one of the big problems with drones: careless or just plain selfish users. Respect the laws and safety regulations, though, and drones can be great fun for people of all ages.

Anthony

8Pack PC At Overclockers

It’s really not cheap, though

In an ‘8Pack’ Perry is quite the deal in the overclocking community, and his partnership with Overclockers.co.uk has now led to the creation of the 8Pack Rocket, a veritable beast of a machine that’s pitched as being perfect for LAN parties.

Powered by an Intel Core i5 6600K processor, this quad-core machine has been overclocked to over 4.8GHz, and it also houses a watercooled Radeon R9 FuryX graphics card, Corsair Vengeance LPX 16GB 3200MHz memory, Silverstone Strider 600W power supply and storage capacity from a 512GB NVME storage drive and 1TB Samsung SSD. All this grunt is within a custom 8Pack Edition case with a customised dual loop and dual transparent reservoirs with Aquero integration and custom Pexon braided cables.

As for technical support, you’ll get 8Pack’s mobile phone number to contact him if there are any problems. Seriously. The price... well, that’s hefty at £4,699.99. Yikes.



Meanwhile... On The Internet...

Yahoo's email system is one of those things that, if you spend any decent amount of time reading IT security news, you will have seen dragged through the mud time and time again (this story, for example – descriptively titled *Why Can't The Persistent Hacking Of Yahoo Mail Be Stopped?* – is from 2013: tinyurl.com/MMnet33a). Some of Team Meanwhile... have had a Yahoo account for longer than we can even remember – long enough for it to have a .co.uk suffix anyway, which we think it stopped handing out years ago and you certainly don't see very often these days. We've never really had any problems, at least as a semi-burner (tinyurl.com/MMnet33b we use to sign up to anything we don't want to read the spam from. Friends of ours, however, have long been sharing anecdotes about problems with rampant spamming (tinyurl.com/MMnet33c), the hacking of their BT Mail accounts (back when Yahoo still handled BT Mail: tinyurl.com/MMnet33d) and being locked out of their own email by people logging in and changing the password from places like Mexico and Russia.

Eventually, in mid-2013, BT backed away from using Yahoo's services altogether, but even that handover didn't go well. Whistleblowers ended up putting BT under the microscope of the UK Information Commissioner's Office for the way it protected (or rather, didn't protect) its user's data during the transfer to a new system provided by a company called Critical Path (tinyurl.com/MMnet33e). Though it was eventually cleared (tinyurl.com/MMnet33f), it wasn't a good look for the UK's largest ISP (tinyurl.com/MMnet33g) and a sting in the tail of its less-than-happy time working with the firm.

For Yahoo's part, it dragged its heels on encryption a little, only moving to better secure its systems when it was put in the spotlight by Edward Snowden's revelations in late 2013 (tinyurl.com/MMnet33h) and in response to security conscious moves by Google. Eventually, it got around to low-key offering end-to-end encryption for email in 2015 (tinyurl.com/MMnet33i). Suffice to say, though, it's never been at the vanguard of attempts to protect user data, and somewhere between those two dates it would appear that its lack of impetus has come back to bite it.

A while ago, you may remember the story of a hacker by the name of Peace offering 200 million or so Yahoo account details on the dark web (tinyurl.com/MMnet33j). Well, it would seem that the hack from whence they came was significantly bigger than that and could have affected 500 million accounts (tinyurl.com/MMnet33k). It's not yet clear whether the discrepancy in those numbers is down to how many of the larger number of accounts are

actually active or whether there's another tranche of data doing the rounds that hasn't yet made it into the public domain. However, it's interesting that it's taken the firm seven weeks to confirm any hack at all (tinyurl.com/MMnet33l). Even stranger, perhaps, is that now it has, its chief information security officer seems to be insisting that the hack was state-sponsored spying (tinyurl.com/MMnet33m), but without offering much clarification as to why that would be. That's a big finger to be pointing, though, so we hope it has good reason to lump itself in with the recent Sony and WADA breaches, or it's going to end up looking even sillier.

Amid all the rumour and conjecture, what does appear to be clear is that not all the data taken was encrypted. Most notable among the unsecured information were the sets of questions and answers that can be used to reset passwords (no, really) – information that could possibly be used to access multiple accounts.

It's now unclear how all this will affect the takeover deal that will eventually see ownership of Yahoo handed over to Verizon for almost \$5bn* (tinyurl.com/MMnet33n). Interestingly, though, the US media giant was denying knowledge of the goings on (tinyurl.com/MMnet33p) until days before the story broke.

As for long-suffering BT Mail users, it's not yet clear whether the breach will affect their email security. BT has, however, released a tool with which you can check if your email service could possibly be wrapped up in all of this (tinyurl.com/MMnet33q). It pertains to anyone with a f@btinternet.com, f@btopenworld.com or f@talk21.com email suffix.

What's clear is that users of Sky email, a service also provided by Yahoo, definitely are involved. However, if a prize could be offered for the least-bothered-sounding admission ever, this would probably win it (tinyurl.com/MMnet33r).

So if, for some reason, you're a Yahoo!, BT or Sky customer who hasn't changed their password since before the theft of all those details (or are using similar security questions and answers elsewhere), it would be best to make some changes to your account login requirements right away, just to be sure (tinyurl.com/MMnet33s). If you're not any of those things, it's time to sit back with some popcorn, enjoy the fallout and learn some lessons about how to keep data safe.

** This will end a long-running saga of what exactly would happen to a firm that was once, almost hilariously, offered around \$45bn (\$31 per share) by Microsoft (tinyurl.com/MMnet33o), but which is now a shadow of its former self*

.AVWhy..?

Regular readers will know of our unashamed appreciation of the musical *Hamilton*, so we offer up no apology for again referring to it here. Last week saw the anniversary of the first play of what would-become the Grammy award-winning soundtrack to the show (tinyurl.com/MMnet33t). To celebrate, its creator, Lin-Manuel Miranda, chose to highlight the work of Sarah Tubert, who sought to bring the music and lyrics of his Broadway hit to a hearing-impaired audience using American Sign Language (ASL). Whether you can understand it or not, it's quite a captivating thing (tinyurl.com/MMnet33u) that was echoed in the show's weekly digital [#Ham4Ham](http://Ham4Ham) video (tinyurl.com/MMnet33v).



Caption Competition



"Oi! Keep your hands to yourself"

Welcome, once again, to our not-very-prestigious caption competition, where we ask you to write funny things about an image, and where you stand a chance of winning nothing at all (other than those all-important bragging rights, of course). Let's see what you made of the picture above:

- **Dwynnehugh:** "And yet she still uses her mobile to contact the 'speaking clock'."
- **JayCeeDee:** "Time waits for no man – but it'll hang about for a pretty lady!"
- **JayCeeDee:** "You should see my backup calendar!"
- **Thomas Turnbull:** "As you can see I'm heading for the big time."
- **Thomas Turnbull:** "This new job of mine can be quite alarming."
- **Thomas Turnbull:** "Hello is that Amazon it's about the jumbo alarm clock you sent me."
- **Len Green:** "She might look young, but time is catching up on her."
- **Alex Martin:** "Well, she did ask for a processor with a big clock."
- **Leigh Spriggs:** "Touch me and I'll clock you."
- **John Sutton:** "She really hates people asking her the time."
- **Tom Benstead:** "Now everyone uses their phones to tell the time, clocks are having to do even more to get noticed."

Thanks for all your entries, and congratulations to our winner this week, Peter Hopkins, who came up with, "Oi! Keep your hands to yourself."

If you have a caption for picture below, head to the 'Other Stuff' section of our forum (forum.micromart.co.uk), or email us via editorial@micromart.co.uk, remembering to add the issue number to the email subject line.



Working Like A Machine

Grim prediction from US

Market research company Forrester isn't going to make itself very popular with this one. The company has suggested that by 2021, robots will have eliminated 6% of all jobs in the States.

Those first on the chopping block are customer service reps, and when self-driving

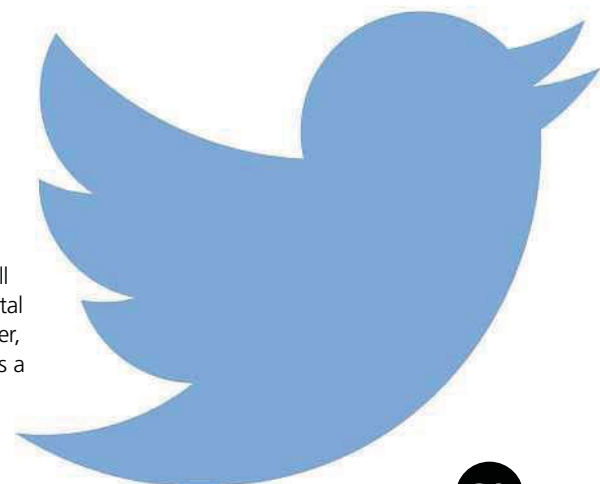
technology gets its act together, truck drivers and taxi drivers had better watch out next. Forrester is basing its rather disturbing assertion on the development of virtual assistants and automated robotic systems over the next five years, which could lead to mass adoption of technologies such as self-driving cars. Blimey. Not very cheery stuff.

Twitter LiveStreams NFL Game

First-time broadcast a hit

Twitter has followed Yahoo's example by live-streaming an American football game from the NFL. The Thursday night game, between New York and Buffalo, attracted an average of 243,000 viewers, which was mightily small compared with the 15.7m average of people watching across all television and digital platforms. However, it's been viewed as a success for the

microblogging platform, and commentators have said that this cements Twitter's position as a potential option for live content going forward.



Snippets!

Email Me? No, But We Could Yammer?

This is hardly surprising, but a slice of research from real-time collective intelligence tool Crowdscope has shown that nearly half of organisations are now taking advantage of social networks within the workplace.

Its study revealed that 47% of companies are using social networking tools within the business, with tools like Yammer, Chatter and Slack leading the way. Emails are still crucial for communicating externally, but it seems that social networking has become commonplace within business.

Microsoft Closes UK Skype Office

Microsoft is to close its UK-based Skype office, meaning that over 200 jobs will be at risk of going. Redundancies will impact both Skype and Yammer employees.

Earlier in the year, Microsoft had announced wider job cuts, so perhaps this isn't a huge shock. Hopefully, some of those affected will be able to be relocated elsewhere within the company.

Pokemon Go Player Live-streams Assault

A *Pokemon Go* player who was live-streaming his progress on Twitch appears to have caught on camera the horrible moment when he was assaulted and mugged while playing the game in New York's Central Park. Footage of the incident can be seen online, which is clearly rather unpleasant stuff. The victim reported the incident to the police, so we hope this one gets resolved soon.

Hybrid Wars!

Relive the 90s with this classic top-down shooter

W G Labs is publishing its latest game on 29th September, the top-down machine-focused shooter *Hybrid Wars*.

In this throwback to the great shooters of the 90s, you step into the shoes of three characters, with the aim of capturing military bases and ultimately doing battle of the robot-kind. *Hybrid Wars* offers gamers open world maps to do battle in, eight locations to explore, over 150 objectives to complete and multiple game modes.

Available in standard and deluxe editions (priced at £13.49 and £14.99 respectively), you can find out about the game at www.hybridwars.net.



Instant Karma

GoPro's foldable drone pairs with new HERO5

GoPro seriously wants to up the action stakes with its latest launch, a foldable drone that fits into a backpack.

The Karma drone was demonstrated in front of a gaggle of media types in an event in California. The drone includes an image-stabilisation grip that can either be handheld or mounted to vehicles, a three-axis camera stabiliser, and it's manoeuvred via

a game-style controller with an integrated touch display.

The drone will ship on its own for \$799.99 or with one of the firm's latest HERO5 cameras, also launched at the event. The new voice-controlled HERO5 models auto-upload to the cloud when charging, are waterproof and deliver video resolutions up to 4K at 30fps. All the detail is over at gopro.com, and the cameras and drone should be out next month.



Vegas, Baby!

Magix updates video editing package

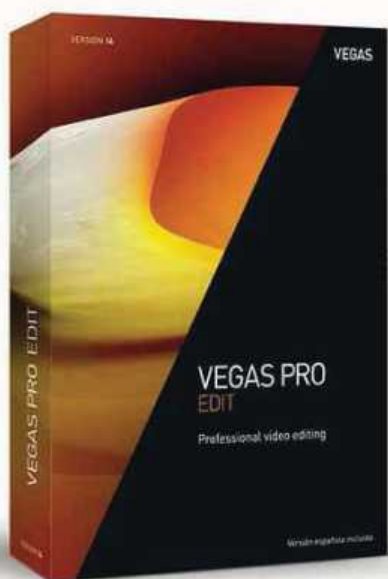
Sony's Vegas Pro video editing software has always been one to consider when it comes to putting together your latest holiday clips. Since Magix (www.magix.com) acquired the software earlier this year, we've been waiting for an updated release, and here it is.

Vegas Pro 14 is on the higher end of the video editing software sphere, so it costs that bit more. The Standard version costs £449, while the pared-down Edit version, which doesn't include Blu-ray/DVD disc authoring software Vegas DVD Architect, costs £299. The Pro 14 suite, which additionally provides 3D object creation and manipulation, motion

tracking and Chroma Key support, costs £599. Blimey.

As we say, this is a top-end creative package, offering tools to upscale HD video for use in 4K and UHD projects, HEVC/H.265 technology to allow users to further compress video, native ProRes support, HFR support, a Smart Zoom feature to reframe shots in post-production without losing quality, and a whole host of plug-ins for things like image stabilisation, filters and video effects.

At this price, this isn't for everyone, but if high-end video editing is your thing, this is most likely worth a look. As is common for Magix products, you can trial this for 30 days too.



Fraudsters Getting Better

Which is worse for all of us

Financial Fraud Action UK has warned that fraudsters in the UK are making more money from our misery.

According to figures from the organisation, there were more than a million incidents of financial fraud in the UK during the first six months of this year. That amounts to one incident every 15 seconds and means that attempts have increased by 53% compared with the same period last year.

Fraud has become a real problem in the UK. Total

financial fraud losses were £755m in 2015, and 75% of those losses were down to payment card fraud, with 22% from remote banking.

The real reason behind releasing this data now is that the FFA UK has partnered with banks and financial services providers to launch the Take Five campaign, with advice on how to stop fraud. The advice is common sense: just stop to take a moment and ask yourself whether you should be disclosing your banking details, for example. Still, if it can help to stop fraud in its tracks, we're all for it.

Apple Wants To Patent Bag

Filing shows firm's intentions

Multiple media reports on the web have pointed to a patent application from Apple for a paper bag.

Obviously, this is a very particular type of paper bag, because the patent actually covers a very specific means of putting the bag together, noting that it must be "formed of white paper with at least 60% post-consumer content" and that it must be reinforced in various ways

to hold its strength and to minimise the environmental impact of its production.

Apparently, this is a patent for bags that Apple is already using in its retail stores.

But don't be fooled: this is very much just a bag – no technology or anything like that here. This is not the beginnings of an iBag. Why the company needs the patent is anyone's guess, but this is a bit of an insight into just how far companies will go when it comes to protecting ideas.

BenQ GW2270

Who says a sub-£100 monitor has to be featureless?

DETAILS

- Price: £95
- Manufacturer: BenQ
- Website: goo.gl/QDcX19
- Requirements: HDMI or VGA connection

The BenQ GW range has some decent entries, some of which we've reviewed in the past and enjoyed. They, however, were toward the top end of the range, so it makes a nice change to get our hands on one of its entry-level models, the GW2270.

It features a flicker-free LED 22" AMVA panel placed within a reasonably thin matte black bezel. Although we don't consider there to be anything inherently wrong with a glossy bezel, there are plenty of users who would happily argue that point and indicate the fingerprint marks and dust collecting nature of the material to help prove their point.

It has a dynamic contrast ratio of 20,000,000:1, native contrast of 3000:1, a 5ms response time and maximum resolution of 1920 x 1080. The avid gamers among you may well balk at the higher response time there but, for the vast majority of users it's more than enough for everyday tasks. The connectivity is ample for most users too, with VGA and a pair of HDMI, plus a headphone port.

While the GW2270 lacks the lure of an IPS screen or DisplayPort connectivity, and it can be considered as having little more than a basic feature set, those design choices do lower the price considerably –



▲ The BenQ GW2270, a cheap but surprisingly good monitor



▲ What it lacks in advanced connectivity, it makes up for with decent screen technology

to less than a £100, if you shop around.

Despite the lack of physical features, the monitor does inherit the usual BenQ line of image improvement software – such as low blue light, Senseye 3 and an improved native contrast ratio. Sadly, though, there's limited ergonomic movement, except for a standard tilt from -5° to 20°.

The design, though, is pretty standard throughout. There's nothing to make this model stand out from the crowd of other excellent BenQ monitors – but then that's not what BenQ is aiming for with the GW2270. Basically, if you're after a sub-£100 screen that works well, then here's the monitor for you.

The quality of the displayed image is really very good, considering it's not an IPS panel. It's perfectly clear with a deep range of quite realistic colours, and it produces a sharp and crisp effect on everything it displays. There's a slight graininess when the monitor is displaying a solid light colour, though this is probably down to the matt-like panel itself, but it's not something that's going to distract you from the viewing – if anything, it's a little easier on the eyes when bright whites and pale colours are displayed. The overall effect, though, is one of quality regardless of the low price.

This monitor undeniably represents good value for money. We'd wager that it will last well and look good for years to come. While the more demanding user among you may well steer clear of this entry level model, the average home office worker or non-gaming user will find it works perfectly well with anything they can throw at it. When you consider that a dual monitor setup using the GW2270 could cost less than £200, it's worth looking into, at least.

mm David Hayward

A good quality monitor for less than £100



StarTech Monitor Arm with Laptop Stand

Better ergonomics for laptop and monitor users

DETAILS

- Price: ~£170
- Manufacturer: StarTech
- Website: goo.gl/CZBBJG
- Requirements: Laptops up to 17", monitors up to 17". 8kg weight limit for both

Shifting to a dual monitor set-up is certainly one of the most beneficial changes you can make to a workspace – providing you have room on your desk, of course. Not many of us can enjoy a couple of 27" screens, though, either through the limitations of our desk's dimensions or due to the fact that we're using a laptop. The latter is especially awkward, as laptop screens usually end up in a much lower position than a second monitor, giving you a weird shift in desktop spaces as you use an extended display.

StarTech, though, has a solution for laptop users who want to utilise a second screen. The Single Monitor Arm and Laptop Stand works by raising both your laptop and the second monitor off the desk to a height where both are, more or less, equally level. This, in turn, frees up much-needed space on your desk and greatly improves your ergonomic setup by elevating the eye-level viewing of the desktop.

The Monitor Arm with Laptop Stand kit is comprised of several components. There's a 300mm pole that attaches to the rear of your desk via a G-Clamp, a 360mm swivel arm that a laptop tray attaches to, a 250mm extension arm into which you'll fit a 300mm spring-loaded monitor mount with a 75mm and 100mm VESA plate.



▲ The StarTech Single Monitor Arm and Laptop Stand make for a more productive and ergonomic setup



▲ Everything you need is in the box, and it's easy to set up

Among those components are the various screws, nuts, spacers and a height adjustment ring to secure the ideal arm heights once you've found the ideal position for your setup. Getting to that point is remarkably easy and, once built, the combined monitor and laptop stand is suitably secure – without any signs of wobble or working loose over time, although you'd probably want to regularly check the tightness of the G-Clamp to the rear of your desk.

The laptop and monitor stand can comfortably hold monitor sizes from 15" through to 27", and the laptop tray

measures 320 x 240mm so there's plenty of room for some of the bigger laptops available; although, to be fair, we were pushing it by using an ASUS G751J 17.3" gaming laptop. The weight restrictions are good too, with a maximum of 8kg for both the monitor arm and the laptop stand.

There's an astonishing array of ergonomic positions into which you can manipulate the stand by adjusting both the monitor and laptop arms. There's a full range of motion, including -90° to +85° tilt, 180° swivel and 360° rotation for the monitor stand, and -90° to +45° tilt for the laptop stand

section. Needless to say, you can also move both arms around to favour either a left- or right-handed laptop position.

The arms are solidly constructed along with the central pole and clamp. There's a two-pronged base that sits on the surface of the desk – with the clamp underneath – that has a small footprint of 145 x 115mm; leaving you with ample space left to fit an external keyboard and mouse. Moving both the laptop stand and monitor arm is easy, the spring-loaded monitor arm can height adjust with a touch and movement throughout the range doesn't feel too dangerous; something we've experienced in monitor and laptop stands. Incidentally, there are also cable tidy clips provided to keep everything as neat as possible.

The StarTech Single Monitor Arm and Laptop Stand is a good setup for those with laptops and secondary displays. It's fast and easy to set up, very secure and safe and has a huge range of ergonomic positions to adjust to. It's also reasonably priced, at around £170.

mm David Hayward

An ideal stand for your laptop and monitor



Huawei P9

Huawei targets the avid phone photographer with their new P9 design

DETAILS

- Price: £449
- Manufacturer: Huawei
- Website: www.huawei.com/uk/index.htm

There was a time when the temptation was to buy Apple if you wanted a high-quality smartphone. These days, however, many of the high-end Android devices are as well made, if not occasionally better made, than the iPhone.

The Huawei P9 is a great example of what the Android customer can purchase today: a high-end handset with all the bells and whistles that you might reasonably expect. Built around Huawei's own ARM Kirin 955 processor, it features a 5.2" FHD display, 3GB of RAM and 32GB of storage that you can augment with a MicroSD card. The battery isn't replaceable, but the 3000mAh installed gives plenty of mileage and the constructional build quality is excellent.

I could babble on about other aspects of this design, but the stand-out feature – and the one Huawei is most pleased with – is the dual lens camera technology. Yes, most phones have two cameras, but the P9 actually has three (two of them rear facing). Not that you can select them individually. Instead, the two Sony IMX 286 12MP sensors operated as a single capture device, with one sensor tuned for colour and the other for light intensity. They provide a 27mm equivalent focal length and an



“ There are some fantastic features in here that serious snappers will love ”

F2.2 aperture with laser-assisted auto focus and DNG Raw capture. I've concluded that video wasn't a priority on the P9, however. It was certainly

something of a surprise that, when using video mode, there is no 2K or 4K capture (only 1080P), though it can do 120fps slow-motion at 720p.

The camera was a cooperative venture between Huawei and Leica, and the latter's logo is emblazoned on the right side of the upper phone back (the two lenses are on the left) to make sure nobody is in no doubt about that fact. Therefore it's no surprise that, for still photography, there are some fantastic features in here that serious snappers will love. There's a completely manual mode where you can alter the ISO and make EV exposure adjustments, but the best feature of all is that you can use the volume button as a shutter release, allowing you to use the phone as a much more natural camera.



▲ The Huawei P9 specialises in producing great shots, but can struggle a little in low-light

“ A powerful and effective design that gives you a crystal clear 5.2” display ”

- Features**
- 5.2" 1080p IPS screen
 - HiSilicon Kirin 955 chipset
 - 3GB RAM/32GB storage
 - microSD slot
 - 3,000mAh battery
 - Fingerprint reader
 - Dual Sony IMX 286 12MP sensors F2.2 aperture
 - Laser-assisted AF
 - DNG Raw capture
 - 1080p Full-HD video, 720p 120fps slow-motion

The results are good, though it does have some weaknesses – especially focusing in low light conditions. The two camera system also doesn't allow for any image stabilisation so, with high ISO shots, movement can become an issue without a tripod.

The other problem I had with the camera was that a non-standard app had been designed to make use of the extended features but, in many respects, it was inferior to the Google default tool. The method it uses for creating a Panoramic is poor and some the

menus are stubbornly in portrait mode even if most photo taking will be in landscape. That said, you don't normally get auto document re-adjustment, light painting or time-lapse on the Google camera app.

I feel equally unsure about the modifications Huawei has made to the Android Marshmallow interface, not all of which seemed well thought out. It appears to have attempted to do away with the application panel and make the desktop perform both functions, regrettably.

Therefore, if you try to remove a system app from the desktop it won't let you, so you're forced to make a folder and throw all the things you don't want cluttering it up in there.

Huawei also seems intent on replacing some of the foundational Google apps – like Clock, Calendar and Contacts – for no obvious good reason, as well as messing with the Lockscreen and notification system in a less than positive way that will annoy Android purists. Installing the Google Launcher helps, but it's disappointing that you're forced to consider that. Indeed, the gratuitous app overhaul smacks of Samsung and HTC, and that isn't a path I'd recommend Huawei heads down.

Conversely, there is little to fault in the P9 hardware. It's a powerful and effective design that gives you a crystal clear 5.2" display with a phone that is only 3mm longer and wider than an iPhone 6, with its 4.7" screen. Huawei has dropped the ball slightly with the USB Type-C port, in that it included one but forgot to use the fast charging aspect of that

technology, which is a shame.

Almost all the other places it could be better are on the software side of the street, and at least that means it can be easily fixed by those so inclined.

At this time the P9 comes with Marshmallow, and it would be reasonable to assume that a Nougat update is currently being prepared. That provides Huawei with a perfect opportunity to make one of its flagship phones even better than it already is.

mm Mark Pickavance

A powerful and elegant phone with impressive photographic capabilities



SteelSeries Rival 500

The Rival mouse range gets expanded with something for MOBA/MMO fans

DETAILS

- Price: €90 (SteelSeries Pre-order)
- Manufacturer: SteelSeries
- Website: steelseries.com
- Requirements: PC or Mac with USB

When I previously reviewed the original SteelSeries Rival, my only negative comments were focused on the design being exclusively shaped for right handed players. The new Rival 500 doesn't address that problem, so I respectfully suggest that lefties should move on to the next review.

There are now four Rival series mice: the entry level 100, with the progressively more impressively specified 300, 500 and 700 models. We're looking at the 500 here, where – rather than changing the look and feel of the design – SteelSeries appears to have preferred to complete a round-robin of the features set and make them all a little better.

SteelSeries is targeting the MOBA/MMO gamers with this design, as it combines extraordinary precision with an amazing selection of extra buttons. The Rival 500 has no less than 15 of them, along with the scroll wheel – all, as you might reasonably expect at this price, user-programmable on a per-title basis.

The most useful buttons are those positioned where your



thumb would normally rest. The lowest of these two being sculpted to be actioned by a very natural thumb movement. If, however, this doesn't suit you – you may find it ends up causing you to press unintentionally – there is a lock underneath that fixes these two buttons in position. As your thumb is also generally needed to hold the mouse in a pincer grip, in the centre of this five button cluster is a solid rubberised area where your thumb can rest between presses.

SteelSeries has used different surface textures to help gamers identify, almost subconsciously, the parts of the mouse they can press and those they can hold. The Rival 500 applies these textures very subtly, but the use of these tactile cues will definitely help ease what can be a frustrating transition to a new control device.

How well this works is a testimony to the research that SteelSeries has done on mouse ergonomics and how gamers actually use their pointing devices. The firm obviously has a shape

and layout that it is convinced works equally well with those who use the Palm, Claw or Fingertip mouse control methods, and I'm inclined to agree with it.

Where I'm marginally less convinced is in the need for the new PixArt PMW3360 sensor. It's rated to be able to detect movement at a staggering 16,000CPI (Counts Per Inch or the number of steps the mouse will report when travelling an inch, eventually relating to how far the mouse will push the pointer across the screen for every inch you move it) and up to 50g of acceleration. I'm not sure what the average control parameters are for the typical person, but this seems massively over-specified for this gamer – and the others I know with 100% human DNA. I may be missing the point somewhat, however, because the scope of the sensitivity spans from 100-through to 16,000CPI; between those bookends is plenty of scope for finding the optimal setting for you somewhere. As USB polling

Features

- Sensor: PixArt PMW3360
- CPI: 100-to-16,000
- IPS: 300
- Acceleration: 50g
- Polling rate: 1ms (1000 Hz)
- Material: Matte top cover
- Ergonomic, Right-handed
- Grip Style: Palm, claw, fingertip
- Number of Buttons: 15
- SteelSeries switches: Rated for 30 million clicks
- Reinforced left and right clicks
- Weight: 129.7g
- Size: 118.75mm x 78.34mm x 43.34mm
- Cable length: 2m



removable section to the rear of the mouse. Using these you can render your own nameplate to replace the one marked 'Rival' in the retail product, should you have the technology. As more people have access to 3D printers or make use of rendering services these are exactly the sort of enhancements that we're likely to see more of.

My only real concern about this product is the extensive use of plastics and the matt finish on the surfaces that will most be in contact with the hand. I can imagine some gamers will have polished those to a gloss finish with a few months.

The cost is what I'd associate with SteelSeries, though if you play often then you'll undoubtedly get your money's worth out the Rival 500.

mm Mark Pickavance

“ Massively over-specified for this gamer – and others with 100% human DNA ”

is 1ms (1000Hz) then the sensor could register 16 clicks between opportunities to signal to the computer, it's worth pointing out.

With so many buttons, so much CPI scope and a nice RGB

lighting option too, the software that SteelSeries made for the Rival 500 is probably as important as the mouse itself. Available for Windows 7 and above and Mac OS X 10.8 or newer, the latest Engine 3

application is the sort of slick tool you'd expect from the firm. Using it, you can create game-specific profiles and tweak away aspects of how the mouse processes movement to your heart's content. What's more, it's designed to work with all the latest SteelSeries gear, so if you have an M500 keyboard or Siberia headset then you can manage them all with one tool.

For the customisation obsessive SteelSeries has also provided 3D files for the

A refined, customisable mouse for demanding right-handed gamers



Seasons After Fall

Ever fancied taking over the body of a fox? Well now you can

DETAILS

- Price: £12
- Manufacturer: Swing Swing Submarine/Focus Home Interactive
- Website: goo.gl/NFiiUU
- Requirements: Windows 7+, 2.2GHz CPU+, 4GB RAM, GT-640+

There's an emerging sub-genre from the indie gaming scene that revels in artistic, wonderful games with a deep story and a sense that they are attempting to promote some sort of self-enlightenment. Titles like *Ori And The Blind Forest*, *Child Of Light*, *Aquaria* and even to some degree *Submerged* are atmospheric games that hope to get you considering and experiencing more than simply pressing the fire button.

Seasons After Fall is one such title, developed by Swing Swing Submarine, this is a gentle but challenging platformer that takes place in a land dominated by nature and magic. You take on the role of a spirit seed, a kind of will-o'-the-wisp that emerges from a sleep of sorts and inhabits the body of a fox, thanks to the fairy-like narrator.

From there you must navigate the 2D platform environment in order to locate the 'Guardians of the Seasons', who will give you the power to control the year's phases and to ultimately restore order to the world around you and bring on the 'Ritual of the Seasons'. It's a complex story and one that's told through a combination of narration, exploration and through retracing your steps to



▲ After learning to use your abilities, you can further explore areas

re-discover areas that are able to be manipulated through your new ability to control any particular season.

Graphically, *Seasons After Fall* is remarkably well crafted. It makes luscious use of colours, which are employed to vividly demark the different times of the year and some equally wonderful animations. There's an artistic brushstroke look to the backdrops and most of the graphics throughout the game, which lends it an almost dream-like appearance. It's nicely done and, when you're playing it melds nicely with the string quartet musical accompaniment of the game's soundtrack to pull you deeper into its ever evolving story.

It's certainly not a short game; even after six hours of playing it, we felt as if we still had a lot to discover and explore. That's not all good news, though, as there's a lot of repetition – which could turn off some players. This revisiting of previous locales could lead to players retracing their steps three or even four times as they begin to unlock more areas. Ironically, though, that's also part of the game's charm and essential to the story. To be honest, if you can get past it initially, the more you become engrossed in the story the more you begin to ignore the fact that you've visited an area previously.

There are several puzzles based on each of the areas

▲ *Seasons After Fall* is a graphically splendid game to explore

you'll visit. They're not too difficult, but one or two will make you stop and think. It's a good mix, though and one that won't necessarily turn a younger player off from playing it. At the same time will have them going through the paces of working out how to continue beyond that particular point.

Seasons After Fall is cleverly developed, with some wonderful and atmospheric graphics enveloped around an interesting and charming story. Importantly, it's well worth the £12 price on Steam and is suitable for gamers of almost any age.

mm David Hayward

An interesting and beautifully presented game



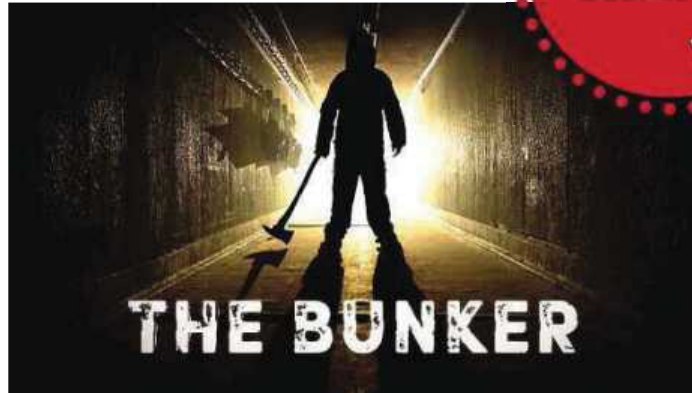
The Bunker

Live action gaming is back in this physiological thriller



DETAILS

- Price: £15
- Manufacturer: Splendy Interactive, Wales Interactive
- Website: goo.gl/IKtYDE
- Requirements: Windows 7+, Mac OS X, 2.4GHz CPU+, 2GB RAM+, GTX-260+



▲ *The Bunker deals with being alone in a post-apocalyptic world. There's a compelling story behind the history of John and the bunker and the cast is excellent, with some fine acting and screenplay*

It's been quite a while since we got our teeth into a live action game. In all honesty, the last one that springs to mind is *Phantasmagoria*. The genre is far from dead, though, unlike the laser disc technology that helped spawn a new generation of FMV games. To prove that point, here we have *The Bunker*, a new FMV title from Splendy Interactive and Wales Interactive, that has you in control of John, the sole survivor of a nuclear attack that wiped out the UK.

John was just a boy when he and his mother, along with other survivors, were transferred to a bunker. Now, 30 years later, he is alone and working through his daily routine. However, a problem with the power supply forces John to delve deeper into the bunker and ultimately his own memories of growing up and what happened to the other survivors.

The story unfolds through a series of flashbacks to John's youth, at the beginning of the attack and through classic point-and-click adventure and puzzle solving. Interaction with the environment is vital, but you'll only have a limited number of options available within any one area. Unlocking other interactive sections within a particular area requires you to solve a puzzle elsewhere and explore your surroundings in greater detail. The

puzzles are reasonably easy enough to resolve. Most just require you to explore more, others, though, require timing – but the mix is neatly paced.

The FMV side of the game is well-directed and further bolstered by being shot in a real nuclear bunker in Essex. The bleak walls, dark stairwells and use of older technology throughout – with a guest appearance of some Commodore CBMs and old Amstrad PCWs – the scene is

perfectly set. There's no CGI, motion capture and so on, just clever use of lighting and props.

One of the failings of live action games is often the cast and script; where the concept is good, it's often ruined by some terrible acting and cheesy screenplay. Thankfully, *The Bunker* doesn't suffer from any of that. There's an impressive cast list, including Adam Brown (*The Hobbit*), Sarah Greene (*Penny Dreadful*) and Grahame Fox (*Game of Thrones*), to help keep the story flowing

and, perhaps more importantly, believable. Interaction with the environment and the choices presented to John are handled well. There are times when you're required to sit through the reading of a maintenance report and other times when frantic clicking is needed to help John overcome an obstacle – such as moving a heavy cabinet out of the way in order to reach a trap door. Other times you'll need to quickly click in a certain area of the screen before the timer runs out, this can open up a new line to the story or prevent John from meeting his maker in an unpleasant way.

Although *The Bunker* doesn't provide heart-stopping terror, there's plenty of physiological horror about it; the dark, being alone in a bunker, John's own fear of certain areas of the bunker (relating to its history and the story) all play a part. It won't have you watching it with your hands over your face, but it's edge of the seat stuff, nonetheless.

For just £15 *The Bunker* is a game that's well worth checking out. If this is the new future of live action games, then it's already off to a great start.

mm David Hayward

One of the best live action games we've played



BUYER'S GUIDE

Drones

Drones get quite a bit of negative press, which isn't surprising when you consider some of the situations these fliers have found themselves in.

The latest generation of drones, though, are quite amazing and feature incredible 4K cameras, self-flying intelligent sensors and more. We have six models to look at this week, and quite possibly the Civil Aviation Authority after us.

Drones

Micro Drone 3.0

DETAILS

- Price: £150
- Manufacturer: Extreme Flyers
- Website: goo.gl/XY5gPt
- Requirements: Control app for Android or iOS

2016 is certainly shaping up as the year of the drone. The market has expanded considerably in recent months, with each newly released model offering more and more functionality.

Extreme Flyers, a British company, has recently launched its newest palm-sized model, the Micro Drone 3.0, designed for both novice and more experienced pilots.

The Micro Drone 3.0 is an interesting bit of kit. While measuring just 50 x 145mm and with a rotor diameter of 55mm, this tiny flier manages to pack in some decent features. It's a quadcopter device that houses an accelerometer, six-axis MEMS gyroscope and contra-rotational motors – allowing you to fly the drone upside down.

Flight time off a full charge is rated at eight minutes, but we managed to get just over ten minutes off the 550mAh lithium cell battery. Its top speed is 45mph and when using the 2.4GHz handset, it has a range of up to 500ft.

Furthermore, there's a magnetic strip on the underside of the Micro Drone, for the attachment of an HD camera. The camera is stabilised by an incredibly small gimbal (the world's smallest, no less) and can capture the video on an SD card, if one is inserted in the camera module, or it can be

streamed directly to a smartphone or tablet.

This is where things start to get interesting with the Micro Drone. The live streamed video can be set to a virtual/first-person view with the aid of the included VR cardboard headset at a resolution of 720p at 30fps. That way, you can effectively get some amazing HD footage from well above the ground, while controlling it as if you were personally flying in the drone.

A lot of drones offer this, but to see it from something that's small enough to fit in the palm of your hand is really quite amazing. Furthermore, with the Micro Drone app, you're able to ditch the bulky handset and control the drone via your phone or tablet.

Finally, if you fancy improving the looks of the Micro Drone 3.0, the company is launching a set of 3D printable designs that can easily be snapped in to replace the standard body. So instead of controlling a drone, you could instead be flying a remote-controlled dragon, for example. It's a clever concept and one that'll surely appeal to the userbase.

Actually, flying the Micro Drone 3.0 is relatively easy. There are three speed settings on the handset that can help you break into the flying

The Micro Drone 3.0 may be small, but it works very well indeed



experience: Slow for beginners, Fast for those who want a highly responsive drone and Insane for expert flyers. The handset can also be configured with a Home Point, whereby the drone will return to a preset position.

There are, of course, countless other flying features incorporated into the handset and the drone. The usual casual and stunt modes are there, along with adjusting the trim settings, and there are different modes that will allow you to roll the drone, as opposed to simply turning left or right.

The Micro Drone 3.0 is a fantastic little flyer that's ideal for beginners and more experienced users. There's plenty to keep you hooked, even without the camera module, and there's room for the product to grow and improve over time.

If you're looking for a great starter drone, then this is one to consider.



DJI F550 HexaCopter

DETAILS

- Price: £275 kit form, more if pre-assembled
- Manufacturer: DJI
- Website: goo.gl/4f9fHe

Requirements:
Soldering iron for non-built kit, controller required, camera, etc.

Although available mainly in kit form, the DJI F550 isn't ideal for beginners



This intermediate-level drone from DJI comes in two different versions, depending on where you buy it and what you want. One option is to have come as a DIY kit, complete with everything you'll need to get up and running for a more personal drone project and experience. The other option is a prebuilt bundle, complete with a GPS module.

There's not a huge difference in the price between the two, but for this review ours was already pre-assembled.

The DJI F550 HexaCopter is an interesting drone, also known as the Flame Wheel. It doesn't look like much when you view it fully built. The plastic arms and frame plates may look a little weak and not up to withstanding too much abuse, but they're surprisingly sturdy.

The arms are made from PA66 30GF, a tough Nylon material that can withstand flexing and impacts for those inevitable times where the drone takes a dive. The frame plates are constructed from an equally strong PCB-like material that's able to take its share of impacts.

There are six 920Kv motors and sets of both 8" and 10" propellers, with two extra of each in case of a breakage. The propellers can be changed to the 10" blades, but only if you

fit a bigger four-cell battery, otherwise you can happily stick to 8" props with a three-cell battery.

Thankfully, there's a NAZA-M Lite flight controller supplied with most of the kits available, but it's best to check beforehand in case the kit you're looking at is missing one. You'll also need to factor in a controller of some description.

Flying the drone is considerably more difficult than the Micro Drone 3.0. This is aimed more at hobbyists, as opposed to those wanting to get up and flying within ten

minutes of opening the box. However, with time dedicated to setting everything up, the flying can be enjoyable, and there's plenty of room on board for optional extras such as HD cameras and so on.

The DJI F550 HexaCopter is quite expensive, at around £275. But once you're up and running, it's a far superior and much bigger model than the usual beginner drones that are available. The problem, though, is with the setting-up process. Unless you know what you're doing or are willing to hunt down several YouTube videos on how best to set up the

“ Suited to those who are comfortable with getting their hands dirty ”

HexaCopter, then the enjoyment of having the DJI F550 can quickly diminish.

While good, the DJI F550 HexaCopter is really suited to those who are comfortable with getting their hands dirty with the building and constant modification of a drone. It's too much for a newcomer, in all honesty, but once you're more familiar with drones in general, we're sure you'll come to appreciate the complexity of the DJI F550.

micro mart

Quality: **7**
Value: **4**

Overall: **5**

Drones

DJI Phantom 3 – Standard Version

DETAILS

- Price: £450
- Manufacturer: DJI
- Website: goo.gl/wBDBy8
- Requirements: DJI Go app, Android or iOS device for control

The Phantom 3 is regarded as one of the easiest and best drones on the market to get up and running quickly. It's a quadcopter with a built-in camera, stabiliser, decent remote control and up to 25 minutes of flying time.

There are several versions of the Phantom 3 available. The Standard version, which we're using here, is designed for beginners and first-time flyers, and it comes with a 12MP camera capable of 2.7K video with a wi-fi downlink at a range of 1km. The Professional version contains all that the Standard offers, but with 4K video and a 12.4MP camera with a 5km range. And finally the Advanced and 4K versions offer slight variations of the previous two, while being priced differently too.

The Phantom 3 Standard is an exceptional drone. It weighs around 1.2kg and has a

The Phantom 3 is a great all-in-one drone



diagonal length of 350mm. The maximum speed is quoted as 16 metres per second, with a maximum service ceiling of 6,000m, but you'll only be able to hit around 500m over the default height limit of 120m above take-off point.

The camera is excellent and fitted to a stabilising gimbal that keeps it steady even in windy conditions. The remote has a mount fitted to the rear, where you can attach a phone and use the DJI Go app (available for both iOS and Android devices) to capture still images or video. Of course, the camera on the Phantom 3 can

take SD cards (there was an 8GB SD card included with our Standard model), so you can record a video without connecting to an app.

The build quality of the Phantom 3 is superb. The main body of the drone is tough and quite heavy, and it's more than capable of taking a few knocks on landing. The landing struts, two legs dropping down from either side of the main body, aren't quite as sturdy as the body, but they're designed to take the stress of landing, so there should be some flex in them. There's also an antenna running down the inside of one of the legs, in a ridge, that keeps everything neat and tidy without too many trailing wires.

Getting the Phantom 3 going is quick and easy; the longest part of the pre-flight setup is signing into the app and running through the brief tutorial, as well as calibrating the compass and checking for any firmware updates. Once ready, though, the Phantom will auto take off to a height of

around 1.2m, and from there it'll hand over the controls to you.

In flight, the Phantom 3 performs magnificently. It's responsive, and easy to fly in both cramped areas and open sky. We especially liked the Home and Land feature, which involves tapping a button in the app, after which the Phantom lands itself hands-free. Incidentally, if you let go of the controls, the Phantom will auto-hover until you take back control of it.

It is, however, quite expensive. Priced at around £450, the DJI Phantom 3 Standard Version isn't something you'd buy on a whim. However, it is the best drone we've ever used to date.



▲ Although it's quite expensive



Parrot Bebop 2

DETAILS

- Price: £440
- Manufacturer: Parrot
- Website: goo.gl/TP5EAG
- Requirements: Tablet or phone, Android or iOS app available

Coming in slightly cheaper than the DJI Phantom 3, the Parrot Bebop 2 camera drone is a second-generation model, with the original Bebop having launched a few years ago.

It's a remarkably easy drone to get up and flying, aimed at beginners and those who want a simple drone that can be easily transported. In short, it's a good starter drone but one with a decent specification and a good camera.

The Bebop 2 delivers around 20 minutes of flight time off a full charge and houses a 14MP camera for 1080p in-flight videos and stills. It's quite well constructed considering its 500g weight and its ABS body with fibreglass reinforcement. It's also quite compact, measuring around 382 x 320 x 100mm.

The pre-flight setup is quick and easy too. You simply drop the propellers into each of the four motors and lock them in place with the included tool, then insert the battery pack, which takes up the remainder of the drone's body length. When you're ready, install the FreeFlight 3 app for iOS or Android devices and connect to the Bebop 2. The app will automatically check for any firmware updates, but these don't appear to be too big, so you should be able to reboot the Bebop within a few minutes of checking the firmware.



The Parrot Bebop 2 is small and works reasonably well

“ The camera is generally good enough quality for most users ”

Once any available updates are done, you'll need to calibrate the drone's compass, which again is a fairly painless and quick process. The Bebop is controlled directly via the installed app, with three possible flight settings: Joypad, Normal and Ace. All bar the Ace mode include an automatic take off, which has the drone hover about 1.5m off the ground, ready for your input, as well as an auto-landing feature.

In Normal mode, controlling the Bebop 2 relies on you tilting your tablet or phone – forward and backward and tilting left and right, with an on-screen left-hand joystick to control the altitude. Personally, we prefer the Joypad option,

with two virtual D-Pad controllers on-screen on the tablet, as we had considerable connectivity problems when using the tablet's own accelerometer. Incidentally, there are videos available that show you how to connect an actual Bluetooth game controller for working with the Bebop 2, but we never tested this function.

The camera is generally good enough quality for most users or first-time drone users. While it's not anywhere near as crystal clear as the DJI Phantom camera, it'll suffice for some good scenery shots and fly-bys off the edge of a cliff. There's 8GB of memory built into the Bebop 2, which can get filled up pretty quickly if you're out

and about. Since there's no option for an SD card, you'll need to transfer the content, which can drain both batteries on the devices you're using.

We did lose connection quite frequently with the Bebop 2. Whether this is something to do with our tablet and phone or the drone itself, we're not sure. So if you're considering one, you may want to test it with your tablet beforehand.

The Parrot Bebop 2 is a decent enough beginner drone. But although it's slightly cheaper than the DJI Phantom 3, we'd recommend you go for the Phantom 3.



Drones

Yuneec Typhoon Q500 4K

DETAILS

- Price: £850
- Manufacturer: Yuneec
- Website: goo.gl/mseZDO
- Requirements: Android or iOS device optional

Moving up through the price range of drones, we have the Yuneec Typhoon Q500 4K, the next step in drone and aerial photography for those who demand more quality and those with considerably bigger bank balances.

The Typhoon 4K is a big quadcopter drone that measures 420 x 420 x 210mm and weighs around 1.7kg. Equally big is the included remote, which features the usual trim and flight configuration settings, a couple of thumbsticks and a built-in 5.5" Android-powered touchscreen, which will allow you to view the content being shot by the camera, as well as providing you with GPS data, speed, altitude and so on.

The build quality of the Typhoon is exceptional, with a toughened body, carbon fibre propellers, a camera gimbal for steadying the video, and sturdy landing gear that gives plenty of clearance for the camera. The rear houses a quick-release battery cover, where you'd simply slot in another battery when you're out and about.



The Yuneec Typhoon is an exceptional drone

The camera is, as the title suggests, capable of 4K video at 30fps and 12MP stills. There's an SD card slot provided, for cards up to 128GB (you get a 16GB card with the package), and when used via the digital video downlink, it's capable of a transmission range of 400m.

Interestingly, the camera mount can be unattached from the drone and fitted to an included handgrip, where there's a clip at the top to fit a phone. Once connected, you can then access the camera via the available app and record using the same camera – but obviously at ground level.

The entire kit comes in a huge aluminium box, which is pretty unwieldy but certainly

strong enough to house the drone and its connected components when in transit.

Flight time is about 25 to 30 minutes off a full charge, and you're given a couple of batteries as standard. Thanks to the unique controller, you can be up and flying in a matter of minutes – bar any updates that may need applying beforehand. The GPS function will automatically set up your drone and attach to as many satellites as possible to obtain data. Needless to say, the Typhoon knows where it is better than you probably ever will.

Flying the Typhoon was excellent. It's smooth, performs well and is extremely responsive. There are even a couple of smart flight features such as Follow Me and Return Home, both of which link the drone with whoever is holding the controller. You can, of course, disable the GPS function and increase the drone's responsiveness via the controller for a more aggressive

approach to flying, for those of you who are better at flying than the rest of us. However, this isn't a racing drone, so it seems a little extreme.

The Yuneec Typhoon Q500 4K is an amazing drone. It's easy to use, fly and set up, and the video quality is breathtaking. However, here's there's a sting: the Typhoon costs in the region of £850, which is quite a lot. But if you're serious about getting some amazing aerial coverage, then the Typhoon has you covered.

“ It's smooth, performs well and is extremely responsive ”



DJI Phantom 4

DETAILS

- Price: ~£1,200
- Manufacturer: DJI
- Website: goo.gl/AzCOmO
- Requirements: Tablet or phone needed Android or iOS app



The Phantom 4 is hideously expensive, but it's quite a technical achievement

Following on from the successful Phantom 3, DJI released the Phantom 4, a drone that pretty much flies itself, while taking 4K video of the surrounding area.

The Phantom 4 is the next generation of drone piloting technology, which adds features such as Tap to Fly, visual tracking, increased speed and more flight time. While purists may balk at the idea of having so much in-flight aid technology present in a drone, the rest of us will certainly enjoy its wealth of helpful flying features.

It's a big drone, much like the Typhoon, weighing 1.4kg and having a diagonal size of 350mm. There are numerous flight modes available, but the overall speed of the drone has increased from the previous generation's 16m per second to a blistering 20m per second when in Sport Mode.

The ceiling is still the 6,000m, and you can effectively increase the altitude settings to comfortably stay within your limits as before. There are four sensors under each corner as well as a couple on the undercarriage, which will detect obstacles in front of the drone, as well as behind, to the sides and even underneath, and when the sensor data is sent to the CPU, the Phantom 4 is capable of avoiding and even flying

around anything that's in its way.

Couple this with the Tap to Fly feature, and you can simply tap anywhere on your tablet – as the environment is viewed through the 4K camera – and the Phantom will fly to that location. On the way, it'll avoid any obstacle and can even monitor the elevation of the land to keep a constant altitude.

The Visual Tracking mode works in much the same way, in that you can select a target via your tablet (for example, a person on a mountain bike), and the Phantom is capable of distinguishing the target from everything else and following it as it moves up to a range of around 5km. You can even make it track you for the length of its flight time.

“ It'll avoid any obstacle and can even monitor the elevation of the land ”

The Phantom 4 also includes the intelligent return-to-home and auto-hover features that the previous model had, and controlling it beyond the smart features is as easy as before too.

Personally, we would prefer to use a dedicated controller like the one the Yuneec Typhoon offers, as you'll need to factor in a decent tablet with good wi-fi for the best possible connection and experience with the Phantom 4.

The build quality is as superb. Everything seems to be reinforced with a combination of carbon fibre, graphite and goodness knows what else. Indeed, it's a very tough drone.

All this, though, does come at a price, somewhere in the region of £1,200, although

you can usually pick up some freebies with it such as a free backpack and so on.

The DJI Phantom 4 is an exceptional drone that's light years ahead of most other technology available. In many ways, it's the perfect drone, but in all honesty, we did prefer the features and functionality of the Yuneec Typhoon and the way it handled with the dedicated controller.

For those with very deep pockets and who can't be bothered with having to deal with controlling a drone but who still want ultra HD quality video, the Phantom 4 is the one for you.

micro mart

Quality 9 | Value 5 | Overall 7

Your Letters

Micro Mart Corporation (MMC)

Your feature on the BBC (Issue 1428) made me consider how important computing has become to the culture and employment in the UK, so I propose a similar Corporation, the *Micro Mart Corporation* (MMC) funded by licence fees of £2.50 a week payable only by those households that read books, magazines or newspapers in print or online. A copy of MMC to be delivered to each licenced household each week. The Corporation would be directed by a Board of Governors, appointed by the government to ensure that, unlike the BBC, it:

- Doesn't drift into institutional bias by only selecting employees from a narrow pre-selected pool of journalists from the LSE or *Guardian* employment adverts
- Doesn't avoid issues it doesn't like by simply pretending they don't exist
- Doesn't get sidetracked into reporting only sports and celebrity computer news.
- Doesn't send huge, costly teams to cover events such as Las Vegas CES or IFA Germany
- Doesn't see the licence fee as an always overflowing pot of gold to pay its expanding number of senior management personnel, and huge employment and severance packages.
- Doesn't expand uncontrollably into multiple titles, multiple websites, multiple podcasts and online video streaming.
- Only allow a small amount of the licence fee to be used to help other magazines that can no longer compete with this highly funded now non-competitive magazine.

Of course a small fleet of licence fee detector vans, using the latest secret GCHQ technology will be required for enforcement action. Now all we have to do is find an MP to support such a bill in parliament.

Greg Browne

Edifier Speakers

Your feature in Issue 1430 about the Edifier portable speaker made me wonder for the umpteenth time when the manufacturers of these devices are going to rate them for features that prospective purchasers presumably want. For instance, how useful it is for ruining a day at the beach for an innocent family; or how far away someone who doesn't want to hear it can be forced to listen to it. Perhaps it could have a rating of 10-plus (especially with its "thumping bass") if the ears of someone in the next cove along the coast can be easily assaulted by it. Surely it's time that reviewers also paid heed to these requirements, so that the selfish types who want them can make an informed choice.

James Gourley

Computers For Students

- I liked your recent article outlining computers and services for students. I would perhaps also suggest the following advice based on experience.
- Reformat USB pen drives as 'ExFAT' rather than keeping the default 'FAT32'. This is because some faculties give students free software packages as ZIP files via secure network drives that exceed 4GB in size.

- Write your name on your USB pen drives and add your student ID number – I have lost track of how many people leave the PC lab with their anonymous drives still plugged in.

- STEM students really need to learn how to use Excel. Few 18-year olds have ever heard of it these days – but it is the most used application for number crunching and creating graphs. Get a good Excel textbook or look at YouTube tutorials for a big advantage. Hold off buying Office 365, though, as most UK students in HE now get it for free.

- If you buy a MAC, make sure to get Parallels.

- Most UK students can legitimately buy Windows 10 as an ISO download for just £10.

- Drive space and RAM are most important as many STEM students in the UK use SPSS, 'R' and GIS software like ArcGIS that needs at least 8GB of memory and use up lots of space.

- Email important documents to yourself as most universities will refuse to grant an

extension for a corrupted pen drive or failed HDD/SSD. Free university account email space is very generous and is backed up every day – so you can use email like a secure cloud storage account at zero cost.

Install the free Adobe Acrobat Reader DC package on PC/MAC as the default PDF viewing apps cannot show embedded audio comments or full markup (often used for assignment feedback) properly.

If you want to buy a MAC, hold off until you become a student. Apple servers detect your IP address being .ac.uk and your academic email address – giving you a generous discount. Finally, as the article advised, you absolutely MUST get a good antivirus package as campuses are breeding grounds for them.

Mark Cresswell

GET IN TOUCH...

By email

letters@micromart.co.uk

By post

Micro Mart
30 Cleveland Street
London
W1T 4JD

Online

forum.micromart.co.uk

Top 5

Macho Names For Gaming Mice

Because you can't move a cursor without an angry-sounding peripheral

1 Razer DeathAdder

In spite of sounding distinctly like a made-up animal, the term 'death adder' actually refers to a whole genus of snakes. As you can imagine from the name, these are highly venomous reptiles, which can indeed kill you if you don't get anti-venom in time.

As far as we know, however, no one has ever been bitten by a computer mouse (a real mouse might bite you, of course, but they don't tend to be venomous). Nevertheless, macho-sounding peripheral maker Razer isn't shy when it comes to macho-sounding product names, and DeathAdder is surely one its finest achievements to date.

2 Corsair Sabre

Long before the world had computers and digital piracy, it had real pirates, and some of them were called corsairs. And some of the ships used for this purpose shared this name too. So this in itself is a pretty macho name, but Corsair takes the testosterone levels a notch up with its Sabre mouse.

A sabre, of course, is a type of sword, a weapon, a means to kill your enemies. What could be more macho than that, especially when it belongs to a pirate?

3 Razer Naga Hex Wraith

On to another Razer product, and here we have a triple threat to deal with. First, the word 'naga' comes from Indian mythology and refers to "a member of a semi-divine race, part human, part cobra in form" (Oxford Dictionary – goo.gl/ZAOnuY).

That's a pretty manly start, and it's immediately followed by 'hex', which is, of course, another word for a magical spell, particularly black magic such as a curse. Plus it's associated with coding, so it's a name that's even more apt for a computing accessory.

Finally, we come to 'wraith'. This, as *Lord of the Rings* fans will know, is a type of ghost. No doubt it's the unhappy spirit of one of the many foes you took down with this extra-manly mouse.

4 Logitech G402 Hyperion Fury

The amateur astronomers among you might know that Hyperion is the name of one of Saturn's numerous moons. And like most of our solar system, it's named after an ancient god – in this case a Greek Titan. One of the 12 children of Gaia and Uranus, he helped overthrow the latter, before being overthrown by the Olympians.

But clearly, being god-like isn't enough for Logitech, because it felt the need to tack on the word 'fury', just in case you were

in any doubt about how muscle-flexingly masculine this mouse really is. Yes, not only is it a metaphorical Titan, it's a really angry metaphorical Titan. Grrrr!!!

5 Cyber Snipa Stinger

If there's anything that shows how hard-core and manly you are, it's deliberately misspelling words. Not only did Cyber Snipa do that with its company name, it also chose a title made of the highly macho words 'cyber' and 'sniper'. Cyber-anything obviously indicates that it's cutting edge and technology proficient, and snipers are clearly relevant to anyone who plays videogames that involve shooting of some kind.

As for the name 'Stinger', it evokes images of bees and wasps, but also Stinger missiles, which fans of first-person shooters will be more than familiar with. If you're not, Stinger missiles are mostly known for their ability to make things explode – like Sylvester Stallone in *Rambo III*.

Yep, if this mouse had arms, one of them would definitely have a tattoo, and the other one would probably be made out of titanium and have a rocket launcher on the end of it. **mm**



▲ Micro Mart's first gaming product: the KillDe@th Raptor K!ckPunch Fire E-sports Pro Revolution Pro Mach-1 Pro Gaming Mouse. (Also works with Microsoft Word)

Micro Bit Coding

Getting Started

David Briddock kicks off a new BBC Micro Bit coding series

The Micro Bit was launched in March 2015 as part of the BBC's Make It Digital initiative. Designed to integrate into the school computing curriculum, the primary goal was to help students to understand how computing systems work through interactive experimentation and coding.

The plan was to give a free BBC Micro Bit to every Year 7 child at the start of the 2015/2016 academic year. But delay after delay meant the boards didn't reach schools until late spring/early summer 2016 (a topic we covered in issue 1408).

Still, the good news is all those design, manufacturing and distribution problems are now well and truly in the past. So much so in fact that this diminutive board is now on sale to the general public. You can order, or pre-order, a BBC Micro Bit from a number of suppliers such as The Pi Hut (thepihut.com/collections/microbit) and Maplin (goo.gl/Tz3kwx).

As for cost, it's a bargain. The board can be bought for less than £15. Buy a starter pack with micro-USB-to-USB cable and a battery pack, and you'll still get change from a £20 note. In other words, it's cheap enough for anyone to own and have fun writing code.

Before we move onto creating programs, let's take a moment to recap the Micro Bit board's features.

BBC Micro Bit

The board itself is about the size of half a credit card (4cm by 5cm). It hosts a Nordic Semiconductor nRF51822 ARM Cortex-M0

32-bit microprocessor running at 16MHz, plus 256KB flash memory and 16KB of static RAM. The ARM core can switch between 16MHz or a power-sipping 32.768KHz clock rate.

It's a double-sided board. On one side, there's a 25-LED display, laid out in a 5x5 array, and two buttons named 'A' and 'B'. There's also a 23-pin edge connector with pulse-width modulation outputs, General Purpose IO (GPIO) pins, six analogue inputs and serial I/O, plus five ring connectors that accept crocodile clips or 4mm banana plugs.

On the other side is a reset button, micro-USB socket and battery power socket. Most importantly, there's also a three-axis accelerometer for motion tracking, a three-axis magnetometer for compass headings or metal detecting, a digital thermometer and a 2.4GHz Bluetooth Low Energy (BLE) wireless networking chip.

First Steps

After receiving your BBC Micro Bit, it's a good idea to run a test to see if it's working okay. This just takes a minute. Power up the Micro Bit by connecting it to your PC or Raspberry Pi via a USB cable. The LED display will instantly burst into life and start to display the output from a pre-installed 'introduction' program.

This program guides you through a few steps to check out the buttons and the accelerometer. There's also a hidden game of Snake. Just press the A and B buttons together when you see the heart animation at the end of the introduction.

While it's great to have something working right away, the real fun starts when we create our own programs.



Online Coding

Last year, the BBC launched an online code editing platform. This is freely available to anyone with a web browser (microbit.co.uk/create-code) and went live long before the Micro Bit hardware actually appeared. A key driver for the website was to help teachers get acquainted with the coding languages and start to prepare lessons.

There are quite a few languages on offer. Microsoft's Block Editor encourages coding newbies with its colourful snap-together blocks. Code Kingdoms also has a drag-and-drop block-based coding interface but actually generates JavaScript code. Microsoft's TouchDevelop is a touch-friendly, text-based development language.

All these languages offer a Micro Bit simulator that incorporates a graphical image of the board. This image responds

Power up the Micro Bit by connecting it to your PC or Raspberry Pi via a USB cable

to mouse input, so buttons can be pressed and accelerometer motion simulated by moving the mouse over the image. You can even click on the input/output pins.

The same website also supports the Micro Python language, but this option doesn't have a simulator.

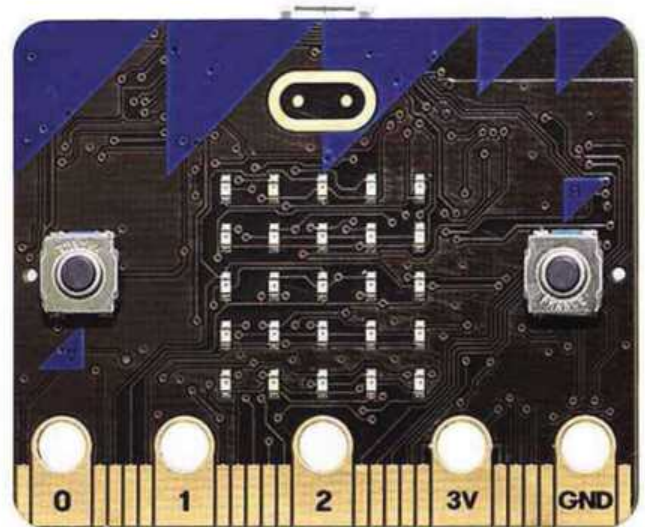
PC Coding

There's plenty to play around with on this website, and the Micro Bit simulator implementation is clever stuff. However, some things are difficult or impossible to simulate, such as compass orientation, movement gestures and wireless communications.

More importantly, holding and interacting with the real thing is a far more intuitive and fun experience. Consequently, that's going to be the focus of this series, meaning you'll need to own (or borrow) a Micro Bit board to play along.

The language of choice for these tutorials will be Micro Python, and we'll use the Mu editor, an open source multi-platform editor that's compatible with the Python 3 language. In fact, the Mu app is itself written in Python code.

More importantly, Mu has been specifically designed to write, debug and deploy Micro Bit programs written in the Micro Python language. Its stripped-down, easy-to-use interface covers file handling, compiling the ARM Cortex-M0 microprocessor 'hex' file, uploading the 'hex' file to a Micro Bit and even an interactive Micro Bit command shell.



▲ Front of Micro Bit

This simplified interface and comprehensive Micro Python support ensures Micro Bit coding is a fast and fun activity. Downloads are available for Windows, macOS, Linux and Raspberry Pi platforms (codewith.mu). Just choose the most appropriate one to you, then download and install the app.

Mu Features

The first thing you notice when you start the Mu app is the super-friendly list of large icon buttons (see image). These cover all the main operations. Let's take a quick look at the some of the key options.

From the left, the first three icons are for source code files. They create a new file, open an existing file and save the current file respectively. Note, you can load multiple files, and the names will appear in a horizontal list below the icons bar.

Next, we have Micro Bit specific icons. As you'd expect, the Micro Bit board must be connected, via a USB cable, to the PC running the Mu editor for these options to work. An error dialogue pops up if the Micro Bit cannot be found.

The Flash icon compiles the Micro Python code into a binary 'hex' format file, then uploads this file to the Micro Bit. The Repl icon opens up a pane below the source code, which contains an interactive Python command shell running on the Micro Bit itself (more on this later in the series).

The next section contains three editing enhancement icons. The first two increase and decrease the font size of the source code respectively, while the third toggles between a standard white-background mode and a high-contrast mode – ideal for those all-night coding sessions.

Next Time

With your BBC Micro Bit to hand and Mu editor installed, next time we'll begin our Micro Python coding adventure by controlling the 5x5 LED array. [mm](#)



▲ Mu Editor icon bar

WORLD BEATING TECHNOLOGY

Which components and devices can claim bragging rights on the world stage? Let's take a look...

Technology, by its very nature, can't help but go forward. Processors get faster, hard drives get bigger and screen resolutions steadily increase. It's a relentless march that we all watch and benefit from.

But where has this progress taken us to date? What are the fastest processors, the biggest hard drives, the most high-definition screens and so on being made right now? We've been scouring the consumer technology market to find out, as well as looking at some cutting-edge designs that could one day filter down to ordinary users.

High Frequency Processor

Which processor offers the greatest raw speed? Well, let's begin by talking strictly about consumer chips, not those found in servers or supercomputers. And to keep things simple, let's just refer to the overall clock speed, without considering the number of cores or the potential for overclocking. Of course, there's much more to processor performance than clock speed – a fact that's perfectly illustrated by the highest-clocked chip we could find being an AMD product (AMD, of course, has been resoundingly beaten into second place by Intel for a long time now).



WORLD BEATING TECHNOLOGY

programmable processors. According to Science Daily (goo.gl/i8LD0s), "the 1,000 processors can execute 115 billion instructions per second while dissipating only 0.7 watts, low enough to be powered by a single AA battery."

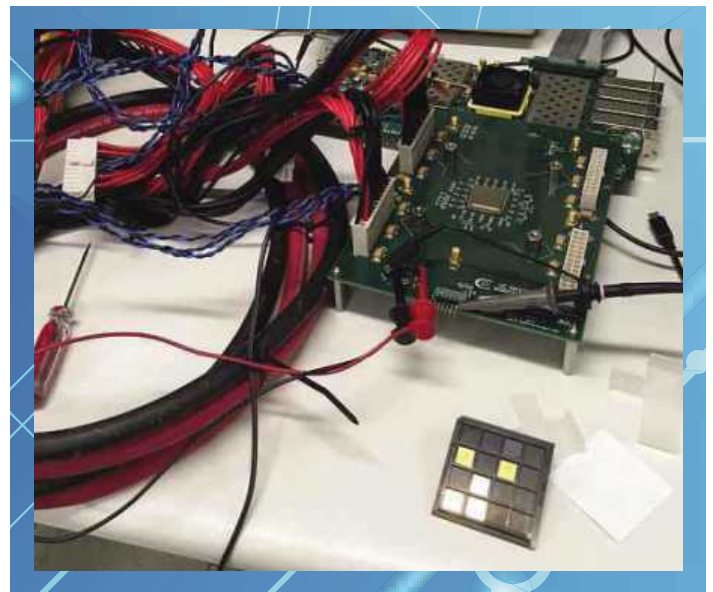
However, considering the speed at which new advancements are made in this field, we wouldn't be the least bit surprised if someone had already produced something even faster by the time you read this.

Most Cores On A Processor

The University of California's 'kilo-core' monster is probably the overall leader here, so let's just stick with consumer products for now, also ignoring things like the 72-core Intel Xeon Phi (code-named Knights Landing), a supercomputer processor that has made its way to high-end workstations. Let's also set aside Intel's other Xeon chips and AMD's Opteron range, which packs up to 16 cores into a single processor.

That leaves the Intel Core Extreme Edition i7-6950X, a ten-core processor with a base clock speed of 3GHz (Turbo up to 4GHz), 20MB of cache and a TDP of 140W. Clearly, a chip like this has extreme multi-tasking in mind, so if you're the kind of person who likes to run 20 web browser windows, while Skyping all your mates, converting your video collection and running your favourite games in the background, then this is the kind of power you'll need.

With Intel's Hyper-Threading technology, it can churn through up to 20 threads at once, but as you can probably guess, it isn't cheap. Currently on sale on Ebuyer for £1,520.98, it costs more than most people's whole computers.



But even if we look at the highest-clocked processor available to consumers, it's not that simple. Yes, the AMD FX-9590 may be a 4.7GHz octa-cored chip, but it's also enormously power hungry, requiring a 1000W PSU. It needs high-end cooling to keep its temperature in check, and it still doesn't match up to the actual performance of Intel's processors. Plus support for this chip isn't great, so your choice of motherboards would be limited if you bought one. It's also a few years old now, having been released in 2013, and considering it lagged behind its competitors at the time, it certainly wouldn't be worth buying today.

Furthermore, even though it seems to be the highest-clocked chip on the market, it's actually just a factory overclocked FX-8350, which is normally a 4GHz processor, which you can get for around £100. The FX-9590, meanwhile, will normally set you back about £190.

The cheaper of these processors is also the current overclocking world record holder, with a massive clock speed of 8794.33MHz (approaching 9GHz). You can see more on this at valid.canardpc.com/records.php.

In terms of non-commercial chips, the University of California may well take the crown, with a microchip that contains 1,000

Largest RAM Module

For a while now, the amount of memory you put in your PC hasn't really needed to be more than 8GB. For light use, even 4GB is enough. And if you really want to future proof yourself, 16GB should be plenty. But rather than buy a 16GB stick of RAM, you should use two 8GB sticks instead, to take advantage of dual-channel technology.

Beyond 16GB, you'll yourself in server or specialist workstation territory, where 32GB and 64GB RAM sticks are readily available. There

are even 128GB DDR4 DIMMs, which Samsung began producing late last year.

The advent of 4K will no doubt push up RAM requirements in future, as larger and larger textures and so on need to be stored in temporary memory, but for now 16GB DDR4 and DDR3 DIMMs seem to be the biggest that are available in the mainstream consumer market.

Biggest Hard Disk Drive

If you go online, looking for the biggest traditional hard disk drive you can find, then 10TB is the magic number. It's not particularly common, though, with Western Digital, Seagate and HGST only releasing their drives a few months ago, and the prices for such opulent storage start at around £400.

As you can imagine, such technology is largely created with the server market in mind, but there's nothing really to stop you splashing out on one of these and using it to store all your photos and home videos, plus the photos and home videos of everyone on your street (and maybe the street after that).

Biggest SSD

Although HDDs remain the most affordable and highest capacity form of storage, they're largely predicted to be completely replaced by solid-state storage at some point in the future. When that will happen is hard to say, but a good deal of investment and research is going into making SSD technology better, rather than the older platter-based drives.

Nevertheless, it was still surprising when, in September 2015, Samsung lifted the lid on the PM1633a, a 15.36TB SSD. Several months down the line, at the end of July 2016, these monster drives began to ship. Even better, they're highly affordable – to anyone who thinks \$10,000 is cheap. If you want enormous capacity and great speed (up to 900MB/s via SAS-12Gbps), then you can't really get much better than this.

For regular (but still wealthy) human beings, 4TB of solid-state storage can be yours for just over a grand, with the Samsung 850 EVO MZ-75E4T0 being a prime example (£1,174.54 from Ebuyer).

But neither of these is a record holder. Currently, that honour goes to Seagate, which showed off a 60TB unit at the Flash Memory Summit in August 2016. Apparently, it could be available to buy some time in 2017, and it's probably safe to say it'll cost about the same as a very nice car.

However, nothing is simple in technology, because Samsung has also staked its claim on this title, with the 32TB PM1643. It might hold less overall, but it's a 2.5" drive, while Seagate's is 3.5", and it actually wins on overall data density.

Fastest SSD

Rather than capacity, the big advantage of SSDs is the speed at which they operate. Hundreds of megabytes can easily be shifted per second, making light work of your big file transfers. But what's the fastest drive there is?

Well, this isn't as easy to answer as it should be, because an alarming number of technology writers and even technology PR people don't seem to know their bits from their bytes. A lot of news sources suggest that the fastest SSD around is a prototype from Seagate, which it demonstrated at various trade shows. Unfortunately, some of these sources say this yet-to-be-released drive will offer transfer speeds of up to 10GB/s (ten gigabytes per second), while others suggest it will be 10Gbps (ten gigabits per second).

This isn't a trifling difference, because there are eight bits in every byte. Transferring ten gigabytes in a second would be immense. Forgive us if our maths is a bit off, but that means you could move the entire contents of a 1TB hard drive in less than two minutes. However, if 10Gbps is correct, then you're looking at just 1GB/s (1,250 megabytes per second, to be exact). Consensus seems to say this will be the fastest SSD in the world when released, and since it's a server product, it makes sense that the faster speed is accurate.



“ Changhong has created a 98” 8K television, and it’ll ‘only’ cost you \$55,000 ”

As for consumers, the fastest you'll find is the Samsung SM961, a PCIe NVMe drive, which offers read speeds over 3000MB/s and up to 1700MB/s write speeds.

Fastest Hard Disk

It should be no surprise by now that the fastest hard drive around is a server unit: the Seagate Enterprise Capacity ST8000NM0055. This 8TB drive connects via either SATA 6Gbps or SAS-12Gbps, it has a 256MB cache, and the spin speed is 7200rpm. Oh, and it'll cost you more than £400 (goo.gl/tkOXH2 – Ebuyer). For your money, though, you'll be getting access to read and write speeds in excess of 230MB/s.

However, you could get a 6TB WD Black for £246.37 from Ballicom (goo.gl/Ft0D10), which is only marginally slower than the Seagate drive. Yes, it's a bit smaller too, but at almost half the





price, it's well worth considering. Or you could simply get yourself an SSD and a regular hard drive and save even more cash.

Fastest Broadband

Before we even tackle this subject, we have to define what we mean by the fastest broadband. Is it the single fastest connection or the fastest connections on average? Well, let's look at both, starting with the latter.

According to the Guinness Book of Records website, the nation with the fastest average broadband is South Korea. However, this statistic is from 1st January 2011, when the average download speed in the country was 33.5Mbps. Oddly, according to content delivery network Akamai Technologies, in Q4 2015, the data transfer rate for the country was 26.7Mbps, so presumably the lower figure uses a different set of data.

However, if you look at average peak connection speeds, then Singapore tops the list with 98.5Mbps.

How about individual connections? Well, if you're lucky to live in the right area, then Hyperoptic, a company founded by those behind Be Unlimited broadband, is offering 1Gbps FTTB (fibre to the building) internet connections (www.hyperoptic.com). Meanwhile, Gigaclear is trialling 5Gbps connections in 10,000 homes in the UK. And in Vermont, USA, Vermont Telephone (VTel) began offering 10Gbps broadband at the tail end of 2015.

But that's nothing compared to the 1.4Tbps (yes, terabits per second) connection that scientists in 2014 established between BT Tower in London and a BT research campus in Suffolk.

Fastest Wireless Internet

As with many things covered in this article, it's hard to say what represents the pinnacle of this particular technology, because technology in general is progressing at such a pace, a new leader could emerge at any time. Researchers are constantly working on better stuff, while the companies that sell such things are often keen to shout about how they've achieved a 'world first', even if it's not always necessarily true.

A headline from January 2016 on PR Newswire, for example, reads "Abu Dhabi Hotel Boasts World's Fastest Internet Connection" (goo.gl/oHnkht). But scroll down a bit, and it says "Jannah Burj Al Sarab's newly upgraded Internet speed is faster than any other hotel in the world". Yes, faster than any other hotel

Turing Phone Cadenza

Making headlines last week, Turing Robotic Industries announced that it was planning to release a phone in 2017 that would blow every competing handset out of the water. This, as you may remember, is the company that created the Turing Phone, the first phone to feature end-to-end encryption.

Its latest device, though, takes innovation to an even greater level. As well as its 60MP quad rear camera, it said to have dual 20MP front cameras, 12GB RAM, 1TB of storage, WiGig networking and a 5.8" 4K screen. It'll also run on dual processors, with two Qualcomm 830 processors under the hood. And to run all this cutting-edge tech, Turing promises that it will have three power sources: a 2400mAh graphene supercapacitor battery, a 1600mAh li-ion battery and a hydrogen fuel cell.

Unfortunately, you won't be playing your favourite games on it, because it will run the Swordfish OS, which is based on the Sailfish system found in its predecessor.

Of course, all this depends on it actually being released. With such lofty ambitions, it has more than a whiff of vapourware about it. If it does make it to sale, we wouldn't be surprised if some of the spec had been downgraded to keep the price realistic. But who knows?

And if it does get released, then you can also look forward to the Turing Monolith Chaconne, which is set for 2018.

That will increase the RAM to 18GB, the storage to 1.2TB and the processor count to three. Plus the display will be a larger 6.4 inches.

in the world, not the fastest in the world. Nevertheless, its 1.2Gbps wi-fi is not something to be sniffed at.

Just a few months later, however, in May 2016, German scientists revealed they managed to transfer data wirelessly 36.7km at a rate of 6Gbps (goo.gl/CY0Tgr). Clearly the distance is what's particularly impressive here, because other researchers have achieved faster speeds, including a 100Gbps wireless network that was created in 2013 by the Fraunhofer Institute for Applied Solid State Physics in Germany, and the 1Tbps 5G connection achieved by researchers at the University of Surrey in early 2015.

No doubt there are even faster connections being set up in labs as we speak, but in terms of what you can actually buy for yourself, you're pretty much limited to AC-class wi-fi. Theoretically, this technology can offer speeds up to around 7Gbps, but that requires the use of multiple channels, and in reality, things like channel contention mean that actual maximum speeds are more like 1.3Gbps.

Biggest Display

Have you ever noticed how, after owning it for a while, your big TV doesn't seem so big any more? When you first set eyes on your 42" telly, you were blown away, but lately it doesn't look big at all – especially when your friends all have 50" screens in their living rooms.

Well, maybe you can offset that feeling for a while by getting one of Samsung's 170" SUHD screens, which it unveiled at CES in January 2016. But as impressive as that might be, your pickier friends might point out that actually that display was made up of several bezel-free screens, so it wasn't really one big display. The same goes for the 370" Zeus, made by the British company Titan.

On that basis, you could instead win bragging rights with a Sharp PN-H120, which, as the name suggests, is a 120" beast of a screen. And what's even more amazing is that it's

actually available to buy. It's aimed squarely at businesses, though, and pricing information isn't freely available, but it's safe to say it won't be cheap. You can find out more at www.ultralargedisplay.com.

But that's still not the biggest single-screen display. In November 2012, Panasonic revealed that it had created a 152" 4K plasma TV. The Panasonic TH-152UX1W will set you back approximately \$500,000.

Still, that's a relative bargain when compared to the C SEED 201 (www.cseed.tv), a 201" outdoor television, designed by Porsche, that not only rotates but rises from the ground and unfolds (again, it's made up of several smaller screens). At \$680,000 it's one for the mega-rich only.



Most High-definition Display

Having an enormous TV or monitor is all well and good, but if the resolution isn't up to snuff, then it's going to look a big rubbish. For most of us, 1080p or even 720p is fine, but at bigger sizes you can see the benefit of 2K and 4K. The latter, however, is still very expensive, and support for it isn't fantastic at the moment.

In spite of a relatively small amount of 4K content being available, however, manufacturers are already producing and selling 8K televisions and monitors. In case you're wondering, 8K amounts to 7680 x 4320 pixels, meaning around four times as many as 4K and 16 times as many as 1080.

Currently, Samsung, Sharp, LG and others are making these screens, but you'll have a tough time getting hold of one if you're a consumer – not least because they cost somewhere in the region of \$120,000 and upwards.

That said, according to Mashable (goo.gl/ATAoKP), Chinese firm Changhong has created a 98" 8K television, and it'll 'only' cost you \$55,000. Probably time to get saving, then.

Most Megapixels In A Phone Camera

In 2012, Nokia unveiled the 808 PureView, a new smartphone with a whopping 41MP main camera (38MP effective). Other than that, it wasn't really anything special: the 16GB storage, 512MB of RAM and 4" 360 x 640 screen, for example, were all relatively standard fare for the time, and the front camera was merely VGA quality. Worst of all, it ran on a version of the Symbian operating system, which by this time was looking older than the painting of Dorian Gray.

But that camera... As well as its ludicrous pixel count, it boasted Carl Zeiss optics, a decent Xenon flash and software features like geo-tagging. And if Symbian wasn't your thing, then you'll be pleased to know that the same camera was later used in the Nokia 1020, which came with the Windows Phone 8 OS – a slight improvement at least.



If you want the ultimate in camera phones, this is the one to get. Or you could wait until 2017 to see if the Turing Phone Cadenza (see boxout) actually gets released as promised. Among its ridiculous specification is a 60MP camera.

Most Megapixels In A Compact Camera

Although not available right now, the Light L16 is set to be the most high-definition compact camera on the market. Announced in October 2015 by the start-up firm Light, it was supposed to have been released by now, but has been delayed until 2017. Promising to match up to a DSLR, rather than having just one

Stuart Hughes Prestige HD Supreme Rose Edition

Got \$2.26 million burning a hole in your pocket? Then why not blow it all on a TV! Of course, at this kind of price, you're not getting your average telly. And no, you're not even getting a particularly big one either. At 55 inches, it's far from being enormous, but in this case, size isn't all that matters, and it's most definitely what you do with it that counts. And what's been done with it is that it's been given a base and frame made from solid 18k rose gold; it's been covered with precious stones, including diamonds, sunstones and amethyst; and it has a secondary inner frame made from alligator skin.

Apparently, only three were ever made, which, in our book, is three too many, because in spite (or maybe because) of all the high-end materials, it looks absolutely disgusting.

Well, they do say you can't buy good taste. Evidently, though, you can buy a very average TV that will cost more than most people will make in their entire lives.

For more hideous opulence, check out stuarthughes.com.



sensor, it has 16 (hence the name). By capturing images at multiple focal lengths, Light promises that it will be able to take pictures of up to 52 megapixels.

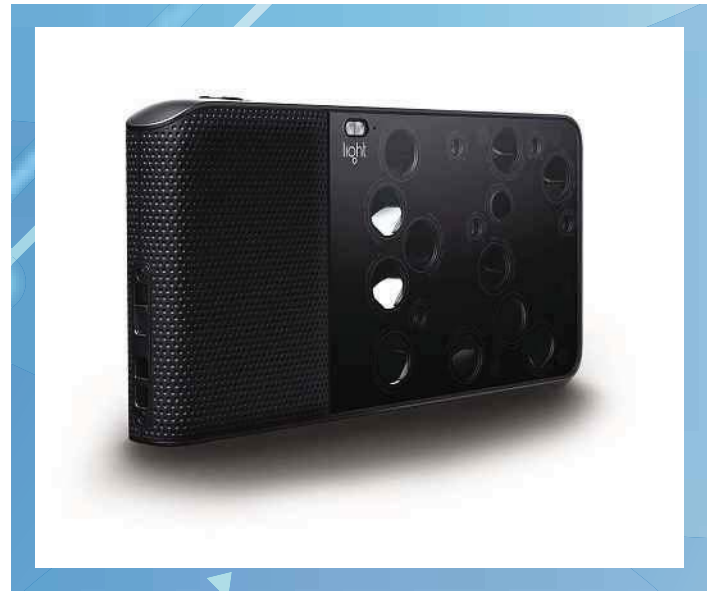
Pre-orders have been healthy so far, and the specs have been bumped up a bit since it was first announced, but such delays are rarely a good sign.

As for cameras that are actually available, they seem to top out at around 24MP, before you find yourself in DSLR territory. That

“ By capturing images at multiple focal lengths, Light promises it will be able to take pictures up to 52 megapixels ”

said, camera maker Sigma released the DP1 Merrill in 2012, which boasted 46 megapixels. You can find this and its successors, the DP2 and DP3, for sale still, but it seems to have been discontinued, replaced by the Quattro range, which incorporate a relatively small 29MP sensor.

Most Megapixels In A DSLR Camera



Now we're at the serious end of the photography market, and it's no surprise that the very highest resolutions are also found here. Of course, more pixels doesn't necessarily equate to better images, but it's hard not to be a little bit impressed when you hear that Canon has built a camera with a 120MP sensor. First announced in late 2015, a prototype of this camera was shown off at a Canon expo in China in May 2016. Interestingly, also in 2015, Canon showed off a 250MP sensor, as a proof of concept, rather than a product announcement.

But neither of these are available right now, so you'll just have to make do with something like the Canon EOS 5DS, which packs in a comparatively tiny 50.6 megapixels. The good news is it'll cost you about £2,500, so it's realistically within the reach of ordinary people. [mm](#)

Remembering... LaserDisc

We contemplate the beginning of optical technology

These days we're considerably more familiar with the capabilities, benefits and issues regarding optical disc technology. Content for the PC on CD or DVD may not be as prevalent as it once was, but there are still some examples of programs or games being delivered via an optical disc of some form.

Back in the mid-80s, though, an optical disc was treated like some form of voodoo. A shiny disc that could contain up to 60 minutes of video, per side? To the ordinary punter on the street, that was quite unbelievable. Remember, this was a time when the Spectrum was still prevalent in UK homes.

Optical technology, though, was available since the late 70s, with recordings of popular movies, in analogue, for the players of the time. However, most of us didn't really get to touch the technology until it became more mainstream either for the PC or when it started to expand into gaming.

Of course, all this optical technology had to start somewhere. The Blu-ray of *Superman vs. Batman* in your video collection owes its very existence to the grandfather of optical discs: LaserDisc.

Its History

Surprisingly, optical disc technology can be traced back as far as 1958. Video was recorded onto a transparent disc by David Gregg and James Russell in the late 50s, patented in the early 60s and purchased by MCA in 1968.

In those ten years, the technology improved considerably, using different techniques to improve both the recording of video and the playback. LaserDisc, which is what the technology was referred to, was released by MCA in December 1978, marketed under the rather funky name of MCA DiscoVision. It's a name that conjures up images of perms, platforms, glittering lurex trousers and our esteemed editor listening to his Osmonds LPs.

Pioneer eventually bought the rights to DiscoVision from MCA at the start of the 80s, changing the name back to its roots, LaserDisc, and releasing the likes of *Jaws* and *Jesus Christ Superstar*.

Around this time, LaserDisc technology started to include gaming. The concept was simple, since a LaserDisc could instantly jump from one chapter on the disc to the next or across multiple chapters, game developers started to use them to create interactive titles.

Rollercoaster is widely regarded as the first true LaserDisc game, although many would argue that *Astron Belt* was actually the first LaserDisc game. Either way, it dawned a new era of true video backgrounds onto which a game could be printed, such as *M.A.C.H 3*, a kind of *Afterburner* game with a real video of the landscape and computerised fighter jets and so on.

1983 saw the release of *Dragon's Lair*, a full-motion video cartoon where the player used the remote control to activate sections of the screen area to make the knight overcome an obstacle. If successful, the

Did You Know?

- *Time Gal*, 1985, was one of the most popular LaserDisc games ever after *Dragon's Lair*.
- 12" discs could be spun up to 1,800rpm in some LaserDisc players.
- Some players had Trick-Play, which gave you slow motion playback in high quality.
- Three encoding formats were used, based on the spin speed of the LaserDisc: CAV, CLV and CAA.

continuing chapter loaded; if not, then one of many end game chapters loaded instead.

Interactive movies on LaserDisc continued for quite some time, even making it to the arcades in the form of *Mad Dog McCree* in the 90s.

LaserDisc, though, eventually started to give way to cheaper CD and CD-i technology and from there DVD. The last LaserDisc ever produced was in 2000 in the West, while Japan held onto the technology for a couple of years more.

The Good

Incredible technology, better video clarity, instant chapter skipping and start-up times.

The Bad

Quite expensive, not a huge amount of content available, not as widespread in the UK as in the US – making it even more expensive. [mm](#)



▲ The LaserDisc: they knew how to make them big back in the day



▲ DiscoVision was what LaserDisc was marketed as in the late 70s

Linux: From A-to-Z

David Briddock continues the series with the letter D

This week, our ongoing A-to-Z stops of to take a look at the wide range of Linux distributions, Debian, DSL, directories and disk commands. So let's get going.

Distros

Linux isn't a single operating system, but rather a large and ever-growing collection of Linux-based 'distributions', or 'distros' made possible by its open source nature. They all stem from the fact that its license agreement ensures all the core Linux code is freely available for download and can be read, changed, recompiled and redistributed as needed.

Distros typically fall into certain categories, or 'flavours', as defined by their Linux parentage. Examples include Debian-based, RPM-based, Ubuntu-based, openSUSE-based, Fedora-based, Knoppix-based, Gentoo-based, and Pacman-based.

“ DSL is an ideal distro for installing on your outdated PC hardware ”

Debian Linux

First released in 1993 Debian (debian.org) is regarded as one of the most mature and established Linux distros. Throughout its long life, new releases have only appeared after extensive testing and bug fixing. Consequently, the open source community values the Debian distro for its stability and robustness.

This reputation has led to Debian being chosen as the basis for many other distros. The process involves adding or removing software elements and applying various optimisation tweaks, before the whole thing is recompiled into a new distro. Two popular examples are the Ubuntu family (ubuntu.com) and Raspbian for the Raspberry Pi (raspbian.org).

Damn Small Linux

The typical Linux operating system has grown substantially in size over the years. Unfortunately, this means most distributions take up a lot of disk space and run best on a fast processor with plenty of RAM.

However, Damn Small Linux (damnsmalllinux.org), also known as DSL, bucks the trend. Although it's yet another Debian-

based distro, it's been slimmed down to just 50MB by using a lightweight X-Windows graphical interface and including only essential applications (by way of comparison, the latest Raspbian Jessie is around 4GB).

This diminutive footprint means DSL is an ideal distro for installing on your outdated desktop or laptop PC hardware.

Directories

Linux is a functionally rich and flexible operating system that contains thousands of files. These files are located within what at first seems a rather complex looking directory hierarchy. However, the good news is the organisation of this hierarchy is pretty much identical for each and every Linux distribution. In other words, once you've got the hang of what goes where with a particular Linux system this knowledge can be applied to different distros.

The key Linux root directories are: /boot, /bin, /sbin, /etc, /dev, /lib, /proc, /var, /opt, /mnt, /media, /srv, /tmp, /usr and /home. There are plenty of websites that provide an explanation of exactly what these directories are for, and the sort of files they contain, such as goo.gl/wQbacw.

Disk Commands

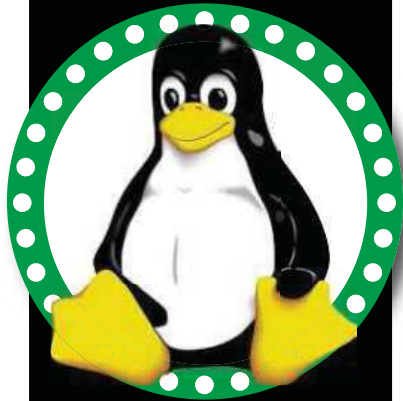
If you'd like to know how much free space you currently have on your Linux system use the 'df' command. Once entered it outputs a multi-row table where each row corresponds to the currently mounted file system. The table's columns contain the associated used and free capacity statistics.

If free space is a problem, you might like to see the files that are taking up the most capacity. This is where the disk utilisation utility comes in. Type 'du' followed by a folder name to see a file-by-file disk utilisation statistics.

To discover all the possible options for these utilities, type 'man df' or 'man du' at the command prompt. [mm](#)



▲ Debian logo



David Hayward has been using Linux since Red Hat 2.0 in schools, businesses and at home, which either makes him very knowledgeable or a glutton for extreme punishment

September Distros

Some interesting releases this month

We've seen some interesting distro developments over the last few weeks, with some new versions being released and one or two stable releases of distros that could come to be quite impressive over time.

Android-x86

The first distro that caught our eye in recent weeks was the stable release of Android-x86, a project designed to port Android to the x86 platform.

The project was originally called Patch Hosting for Android x86 Support, with the idea being to simply host different patches from the open source community. However, as the project grew the developers started to consider what else they could do. The end result is an OS based on Google's Linux kernel-based mobile operating system.

Android-x86 6.0 R1 is currently available in two pre-built images, which can be found at goo.gl/DBJLWP and using Kernel 4.4.20, Mesa 12.0.2, HDMI audio support, F2FS support and better mouse control.

Debian 8.6

September 17th saw the sixth update of Debian 8, codename Jessie. Although it's not a huge update, there are ample security patches and fixes along with plenty of miscellaneous bug fixes.

The security side of the release sees the likes of Samba, Tallocc, Chromium-Browser and Firefox getting some much-needed updates, along

with a whole gaggle of other packages. A full list of both the security and miscellaneous patches can be found by visiting goo.gl/TLi50m.

Chapeau 24

The UK-based Chapeau project, based around Fedora, has recently announced the beta for version 24. This is an excellent distro, which features a Gnome 3.2 desktop, LibreOffice 5, PlayOnLinux, Wine and even Steam.

It's certainly a comprehensive offering with a wonderful looking UI, loads of programs and tools and plenty to get your teeth into.

Although Chapeau 24 is still only a beta – at least that's the case at the time of writing – it's very stable and flies along nicely on our test system. If you're interested, and you probably should be, then take a look at goo.gl/hM6FKR for more information.

Elementary OS 0.4

The wonderfully presented Elementary OS has announced the stable release of version

0.4, Loki, the successor to Freya that was released last year. Since Freya's release, the team has been hard at work closing issue reports, implementing new features and options and ironing out the bugs that inevitably find their way into a distro.

Loki sees the implementation of new system indicators, a new notification centre, application menu improvements, redesigned system settings and some improvements to the desktop dock. There are countless more we could list, that come together to make Loki one of the best looking and more interesting distros currently available. For information, visit the main Elementary OS page at goo.gl/F0jWqg.

Let Us Know!

As per usual, there are always more releases than we have space for. If you've got a distro you follow that has a new release, then write in and let us know about it.

Until next week, folks.

▼ *Chapeau, now in version 24 and looking pretty good too*



Vampiric Tendencies

Sven Harvey takes a look at a board for classics

FPGAs are clever little chips. Field Programmable Gate Arrays (for that is their full name) are essentially software reconfigurable silicon. A 'core' can be created to make the FPGA chip pretend it's a processor or even cluster of processors and/or custom chips. An early Amiga-related example of this was the Mini-Mig, which had an FPGA that had a soft-core reimplementation of the original or enhanced Amiga chipset alongside a more recent 68000 processor model. FPGAs have developed since then, and main processors can be mimicked and more than exceeded.

Of major interest to the classic community of Amiga users is the Vampire series of boards from hardware designers Igor 'Majsta' Majstorovic and Brian 'kipper2K' Robotham. The A600 version of the Vampire is the only one to have had a decent production run so far, and fits snugly over the processor on the A600 main board to function.

The current Apollo Gold core (by Gunnar 'BigGun' von Boehn and Christoph 'ceuch' Hoehne) for the accelerator's Altera Cyclone 3 FPGA, clocks the pseudo-processor at faster than a 100MHz 68060. This makes it the fastest 68000 a-like CPU ever made available, but the board also features a micro-SD card slot to replace the machine's hard disk, and 128MB of RAM is included on board (a bit of a jump from the original 1MB.)

However, in a further effort to pull the A600 kicking and screaming into the 21st century, the board also features a digital video out in the form of a HDMI port, though pass-through of

News Bytes

True to its word, A-EON Technology Ltd. is continuing development of Personal Paint for classic machines alongside the development of the AmigaOS 4.1 version, though perhaps a little behind in release schedule. Personal Paint 7.3b for classic Amigas running AmigaOS 3.x is now available for purchase and download from the AmiStore or www.ppaint.com.

Enhancer Software 1.1 has been released as a free upgrade to the original release of this collection of programs designed to enhance the AmigaOS 4.1 user experience. You can purchase the Enhancer Software in a Standard or Plus edition from www.amigakit.co.uk in the UK, and the discs contain the 1.1 release of the software collection, which requires Amiga OS 4.1 Final Edition, which the company also sells.

A book looking at making the most of AmigaOS 3.9 is being translated into English for the first time for release in January. Originally published in Polish, the publishers are opening up their book to the wider market, with the volume including tips for OS3.9 and 3.5 as well as guides and recommendations of software for the later classic operating system. You can find out more at goo.gl/kbTqUH.

audio is not a clear option at the moment (but further core updates may result in this)

The board has proved to be immensely successful; more popular than production can sate, in fact. This has led to prices on ebay being driven up as a result, with various videos of systems working and reviews on YouTube driving demand even more – alongside the possibility that future core updates could allow the use of AGA software on an A600.

The Amiga 500 version has reached late prototype stage, with one unit having being offered on ebay, whilst the A1200 version appears to have stalled. According to the latest update I could find, the delay



has been due to a problem finding the special edge connectors that would allow the board to fit more elegantly in the Amiga 1200's trapdoor slot. The delay to that version is a massive shame, as it could end up being the most popular of the boards. Hopefully, a bigger production scale will be considered for that.

Development is on-going, but you can find out more information at the developers' websites at www.majsta.com, www.kipper2K.com, and www.apollo-accelerators.com.



Sven Harvey has been our Amiga specialist for over 16 years, drawing on his 25 years retailing computer and video games and even longer writing about them

Amiga



Ian McGurren is a professional IT analyst, a semi-professional writer and a pretty amateur electronic musician. He likes gadgetry and loves making gadgets do things they were never designed to do

Mobile

Now We Are 10

Ian McGurren picks 5 features from iOS 10

So iOS reaches an important milestone, version 10, though with less fanfare than you might expect (and Apple even resisting calling it iOS X). Yet, while iOS 10 hasn't ushered in the wholesale changes some may have expected with such a seemingly significant milestone, it's still a worthy update with more features than it might appear at first. Here's a pick of 5 notable areas where things have been tweaked.

1 Messaging Apple knows that it has something of a struggle on its hands when it comes to going up against the messaging behemoths of Facebook, whether that be WhatsApp or its eponymous Messenger, especially when its own Messenger doesn't exist on any other platforms. However, with iOS 10 Apple has upped its messaging game, going all-in on a combination of GIFs, stickers, drawing, and er, heartbeats. And... it's pretty good; certainly different enough to warrant use in certain situations (such as where only the Carlton dance will adequately get your point across).

2 Apple Music I use Apple Music, but the best I can say about it is... it's okay. The app has finally been updated and it's a bit better, but there are still weird issues with negotiating the UI if you've not got 3D touch. At least it's more logically laid out, easier to read, and the curated playlists are finally easier to find.

3 Bedtime And Health When introduced, the Health app nicely brought together the data from lots of different apps and devices, including the Apple Watch. The updated app is a friendlier affair that gives handy prompts as to which apps supply the data you're after and integrates with more hardware. There's also Bedtime, a combination alarm/sleep-tracker built into the clock app, but integrated into the Health app. It's simple to use and well designed.

4 Notifications If there's a notable visual change in iOS 10, it's the more rounded and solid look of the UI that's apparent in things such as the notifications. Looking more friendly than before, and with a touch of the

old iOS about them (and even a touch of Android), they still work in much the same way, and you're able to react to many of them direct from the notifications still. A downside is that, while they look nice, the colour scheme means they aren't as easily readable by lock screen glance.

5 Split Safari Windows Finally, on iPad, there's a way of viewing two browsers side-by-side with Safari. Holding down the tab button in landscape offers Open Split View as a choice now, and this opens a second, independent instance of Safari. So for those using say, WhatsApp web or a video stream, this is a way of keeping an eye on it and on your browsing at the same time.

It's not all good news, though, and there are some initial humps to get over. For example, if you have a touch ID enabled device, it's now a two-step process to unlock your device – authentication with a finger and then hitting the home button to open the device. This is down to allowing some tasks to be completed on the lock screen without needing to open the device fully (such as replying to a notification or using the updated widgets). It makes sense but is a bit jarring at first (and can be turned off if needed). Other than that, iOS 10 is worth grabbing.

“ With iOS 10 Apple has upped its messaging game ”

iOS 10

Nvidia's GPU Get-down

Andrew Unsworth wishes he was at the GPU Technology Conference in Amsterdam, but consoles himself with some sweet Roland sounds

Following on from talk of the Drive PX 2 last week, Nvidia is hosting the GPU Technology Conference in Amsterdam (www.gputechconf.com) on the 28th and 29th September, the latter date being the day when this magazine hits the shelves. That means it's too late to get yourself a seat, but it does mean that it's worth scouring the net for news about it to read about the state of the GPU art, and maybe it's also worth diarising the event for next year.

The event takes the form of seminars on topics such as Challenges and Research Needs on Automated Driving, and TomTom Enabling Localization and Deep Learning Powered Mapping, to Using Deep Learning for Trading and Deep Learning for Object Detection. There are also exhibitors, a "VR Village" and various opportunities for getting your hands on the fun stuff.

The GPU Technology Conference sounds like a great event for those interested in the appliance of GPUs to solve problems other than moving games characters around a screen at speed (not that there's anything wrong with that). I would love to have been there. Maybe next year?

Boutique Badboys

Roland's 909 day came and went, and with it came announcements of some wonderful new noisemakers. One product is the DJ-808 (tinyurl.com/hyn2evj), a DJ controller with a cut-down version of the Roland AIRA

TR-8 drum machine, called the TR-S, bolted onto it. This allows DJs to augment their mixes with their own rhythms, which is a real boon if you're remixing tracks live or creating a live mash-up, as it means you can add a common beat or use some drum rolls to build up tension.

The DJ-808 is used to control Serato DJ, which runs on a connected computer. The DJ-808 also lets users attach synths and drum machines to it, to allow the creation of a sort-of crossover studio. The DJ-808 synchronises the tempo of the TR-S with the tunes playing Serato DJ, so it'll keep in time automatically.

I've had a go on the DJ-808 and it seems like a neat bit of kit. Not for everyone, but it's well worth checking out if you're more DJ than producer, but still keen to add more creative spice to your mixes.

I'm a big fan of Roland's AIRA range (tinyurl.com/zquqv53) of musical instruments, partly because of the flashing lights, but mostly because the range fuses Roland's retro instruments with modern technology and workflows. Two popular instruments are the AIRA TB-3, which is a modern

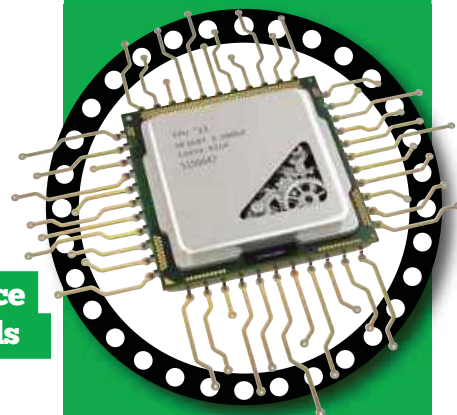
version of the classic TB-303 bassline synth, and the TR-8, which is a modern take on Roland's classic drum machines. However, the flashing lights are not for everyone, so Roland has created two brand new units called the TB-03 (tinyurl.com/gwrjdam) and the TR-09 (tinyurl.com/zak7mp5), especially for the puritanical, retro-loving beard-scratchers out there.

The TB-03 and TB-09 are more faithful replicas of the classic instruments, although they're smaller in scale; in fact, they are pretty petite. I've had a go on these too and loved them to bits in the time I had with them.

The two devices are battery powered and are delightfully portable. They can also be powered via USB. However, while some may consider what I'm about to say to be heresy, although they're fiendishly fun I don't think they're as charming as the AIRA instruments. You, however, may feel quite differently.

If you want to avail yourself of these and other Roland products, keep your eyes peeled on your local music shop's window display or check out online retailers such as www.dawsons.co.uk and www.scan.co.uk.

▼ *The TB-03, a purist's recreation of the classic TB-303 'Acid House' synth*



Andrew Unsworth has been writing about technology for several years, he's handy with a spanner and his handshaking skills are second to none

Hardware



Ryan Lambie has loved videogames since he first stared up in awe at a *Galaxian* arcade cabinet in his local chip shop. 28 years on, Ryan writes about gaming for Micro Mart. He's still addicted to chips and still useless at *Galaxian*

House Of Pain



Capcom goes back to basics in the survival horror sequel, *Resident Evil 7*. Expect lots of scares and puzzles, but a bit less action and even fewer machine guns...



This week, Ryan looks at *Resident Evil 7*, and checks out footage from Konami's multiplayer *Metals Gear* spin-off...

Plug & Play

For the past 20 years, the *Resident Evil* franchise has drawn heavily on the zombie movies of director George A. Romero for its survival horror chills. In the forthcoming *Resident Evil 7: Biohazard*, Capcom's turning to another staple of American horror: Tobe Hooper's 70s classic, *The Texas Chain Saw Massacre*. A conscious effort to reinvent the franchise after the critically divisive, action-oriented sixth entry, *Resident Evil 7* will, we're told, largely take place in one location (like the first game).

That location is an old mansion, home to a family of crazed degenerates called the Bakers. Like the murderous clan in *Texas Chain Saw*, the Bakers have a penchant for murder and cannibalism – worrying hobbies, given that they apparently have something to do with the protagonist's missing wife.

For the first time in the franchise, *Resident Evil 7* will take place entirely from a first-person viewpoint; with its confined spaces, measured shocks and lack of weapons, it looks less like a return to the series' roots than a response to the modern survival horror genre as a whole. *Resident Evil* may have defined these kinds of games but, while Capcom

became increasingly side-tracked by gunplay and action set-pieces, western titles like *Outlast* and *Amnesia: A Machine For Pigs* have positively revelled in creating an atmosphere of out-and-out dread. While weapons will still feature to some extent – shotguns and flamethrowers reportedly make an appearance at some point – they'll be far from the main focus. The closest comparison we can think of is The Creative Assembly's legitimately terrifying *Alien: Isolation*, where survival generally relied on one primal response – finding places to hide from the titular monster. Pistols and blunt instruments may play their part in the game, but discharging a gun is also likely to garner unwanted attention from something angry and toothsome.

For now, Capcom are remaining coy about the way *Resident Evil 7* will fit into the series' wider mythos; all it'll say is that the *Biohazard* subtitle – the actual name of the franchise in Japan – provides a hint of how it connects to things like the Umbrella Corporation or the S.T.A.R.S. Alpha Team, which are otherwise absent in the promo stuff we've seen so far. Our main concern is that the Bakers and their old plantation house will be the slow-burn first

act in a larger story – where it turns out there's an Umbrella lab under the mansion, say – and that all the atmosphere built up at the beginning will give way to something goofy and disappointing. For now, though, we're just relieved that Capcom's trying something different; for the first time in years.

The *Resident Evil* franchise may be about to get truly scary again, but we'll have to wait for *Resident Evil: Biohazard* to appear on the 24th January, 2017 before we really know for sure.

Online

We first heard about *Metal Gear Survive* – the multiplayer spin-off from *The Phantom Pain* that sees a group of elite soldiers from Mother Base sucked into an alternate universe a few weeks ago. Faced with a hostile – and astonishingly grey – landscape, it's up to the soldiers to use their skills of defence, stealth and infiltration to, well, survive. The recent Tokyo Game Show provided the venue for a generous slab of gameplay footage (youtu.be/1E_SDciGbTk), which shows how Konami has applied the free-form tactical aspects of the most recent *Metal Gear* game to this cooperative survival spin-off. The result looks remarkably like the source game



◀ *Phantom Pain* co-op spin-off *Metal Gear Survive* was one of the major games at the Tokyo Games Show. It pits up to four players against a zombie-like horde



– it’s clearly running on the same Fox Engine – but also a little bland. The narrator excitedly points out that “there’s a creature up ahead”, but all the creatures we’ve seen so far are basically just beige, topless zombies in black trousers. Left undisturbed, the creatures generally just stand around doing nothing; pull off a prank like hoisting a sheep aloft with a Fulton Cannon, and the enemies just gather round it, shaking their fists.

The enemies present a bit more of a direct threat in defence missions, where they start lining up at the perimeter of your base and have to be kept at bay by positioning barbed-wire barricades and the like. Even here, though, the creatures tend to just plod about or attack with flailing arms. We’re hoping that Konami also has some more intelligent enemies in store, and not ones just zombies that rely on numbers to wear players

Camp Horror

If *Resident Evil 7* looks just a little too scary for you, then the free browser game *Slayaway Camp* at least offers plenty of laughs as well as shocks. Essentially an isometric puzzle game, it casts you in the title role of a slasher movie-style bad guy who has to hunt down his victims. *The South Park* meets *Minecraft* visuals and slapstick tone make the slashing more comic than horrific, and the puzzler gameplay itself is fiendishly addictive. You can try it for yourself at tinyurl.com/jodcqh5.

▼ *Puzzles and horror collide in the brain-teasing slasher spoof, Slayaway Camp. Best of all, it’s free to play in your browser*



▲ *Never mind the title, Japanese life sim Birthdays The Beginning looks like a delightful mix of Spore, Minecraft and Populous. It’s due out next year*

down. Tellingly, the gameplay footage ends with the players losing control of their base and, as the monsters swarm all over the place, the soldiers hop over a wall and beat a hasty retreat across a field.

We’ve no doubt that *Survive* will provide plenty of solid entertainment when played with friends (your squad can comprise up to four players), but the new footage also shows just how badly the *Metal Gear* series needs a designer with Hideo Kojima’s warped imagination.

Incoming

If you’ve ever owned a Nintendo console, you may have heard of *Harvest Moon* – a series of whimsical life-sim RPGs about setting up and maintaining a farm. The franchise is still going under a range of different names, but *Harvest Moon’s*

original producer, Yasuhiro Wada, has long since moved onto new pastures. Wada’s next game goes by the bizarre title of *Birthdays The Beginning*, which doesn’t appear to have anything to do with the action itself: it’s a really involved-looking life sim in which you fashion a living planet out of a huge block of voxels, and then help support the life which begins to evolve: first there’s simple marine life in the water, then dinosaurs and then cute fluffy mammals. The presentation looks typically warm and Japanese, but the systems which underpin the terraforming and evolving lifeforms look surprisingly complex.

Birthdays The Beginning is heading to Steam in early 2017. It looks a little bit like the classic *Populous* except with lots of animals, which can only be a good thing. **mm**

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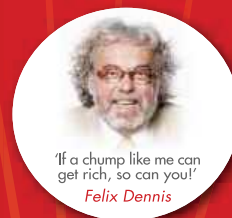
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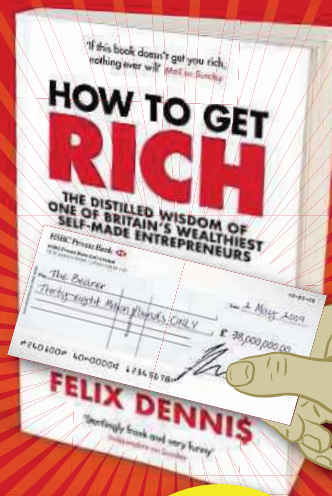
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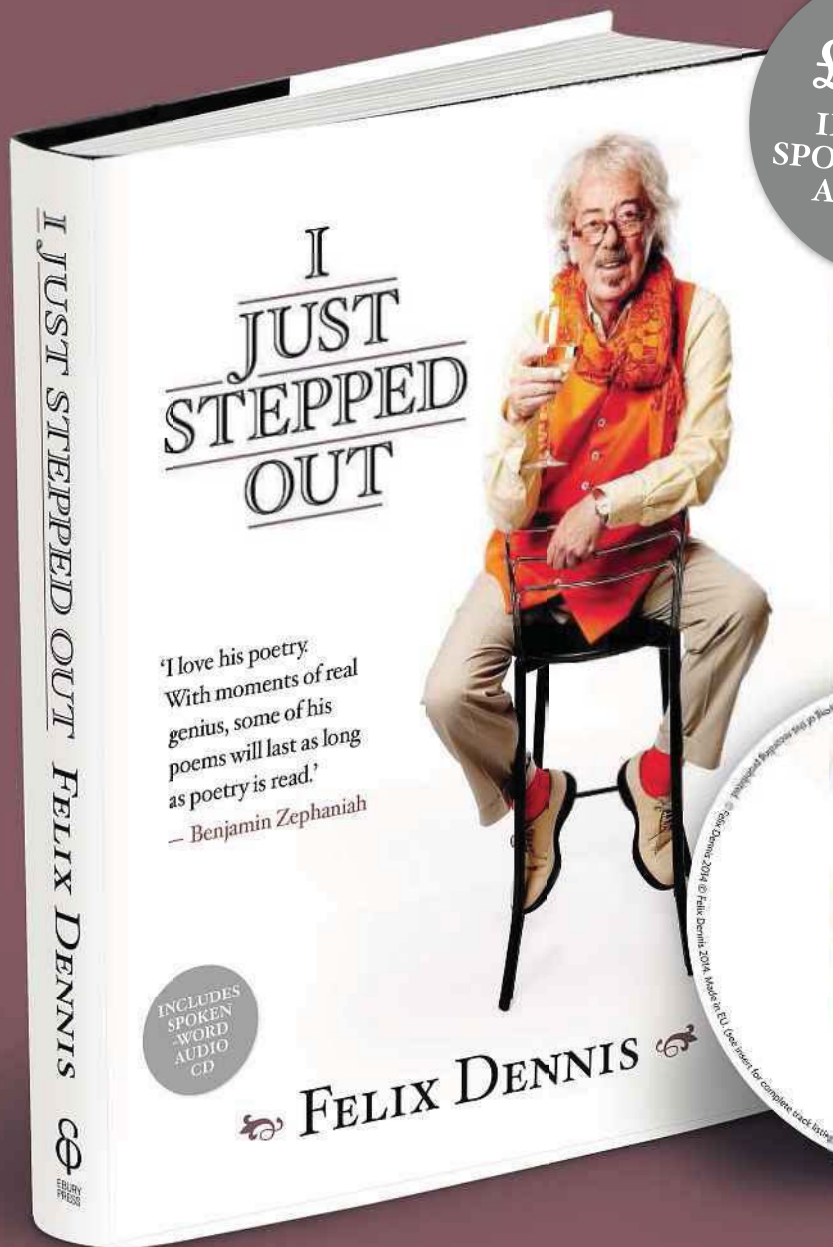
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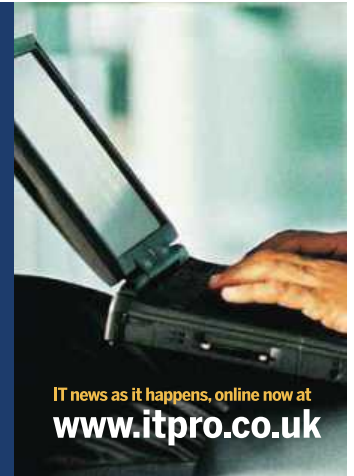
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Aaron

AGI?

I am still running a perfectly serviceable ASRock ConRoeXFire-eSATA2 with Windows 7 Pro X64 for everyday computing and email, but I need to fit a modern Wi-Fi card. I was wondering if I could use the AGI express slot, which looks like a regular PCI-Express slot. So the question is am I good to go or am I stuck with the older PCI slots?

My thanks in advance,

Mike

This is a classic example of poor naming and marketing on the part of ASRock that only caused confusion with users, and understandably so. The AGI port is actually a proprietary form of the standard AGP port. This was an AGP port connected to PCI, and was called AGI Express. It was a PCI Express x16 slot with x4 lanes.

This means it's not a PCI slot that's used for graphics cards, so you'll need to stick with the standard PCI slots to fit your wi-fi card.



▲ ASRock's AGI slot was a proprietary inclusion on ASRock's motherboards

Icon Gone

My Windows 8.1 system has been giving me trouble. It's an HP system and it's usually very dependable. Lately, it's started to boot up to a blank screen with no icons. I've also noticed the system seems to be taking a very long time to boot up.

At first, I thought the icons weren't showing because the system was still loading, but after I left the PC for over 30 mins, I decided to try another reboot, and the same happened. The cursor was visible, and moved around, and I could right-click the desktop to get a menu. I realised that the system was working, but my icons just weren't visible.

It's making it really hard to use the PC, and I can't run any programs. I hope you can help.

Emily

I'll cover the basics here first, just in case, although I suspect you may have already tried some of them. First, right-click the desktop and select View. Make sure the option to show desktop icons is selected. If this works, great. If not, let's continue.

If possible, open up the Charms bar on the right of the screen and then go to Settings > PC Settings > Update and Recovery > Recovery, and then pick the refresh option. Once this has finished, try rebooting the system to see if the refresh has worked.

Another possible trick is to press Ctrl+Alt+Del, open Task Manager and end the Explorer task. Now, go back to Task Manager and click File > Run new task. Type 'iexplore.exe' and press Return. This will kill off Explorer and then restart it, which may be enough to kick the system into action.

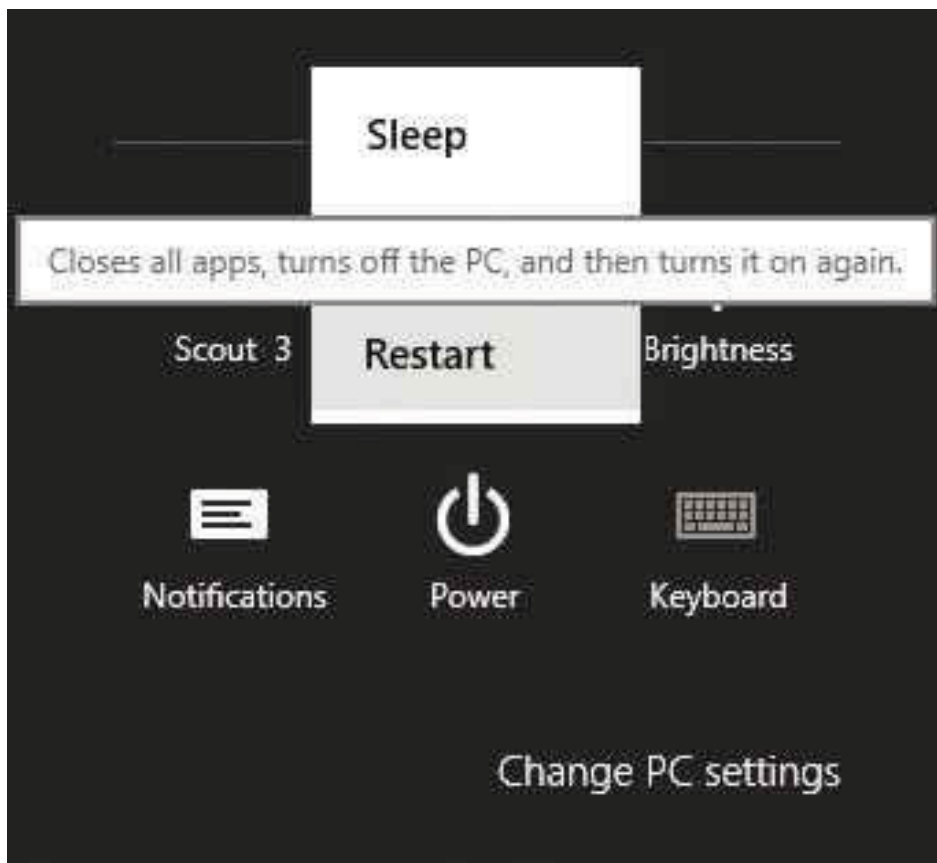
If you're still having problems, try booting into Safe Mode. To do this, press Ctrl+I and while holding Shift, click Restart. When the system reboots you'll see the troubleshooting menu, so select Safe Mode. See if the desktop icons show up when the system reboots. If so, you may have some problems with software and/or drivers, and will need to use Safe Mode to investigate this by using a selective startup.

To do this, press Win+R and type 'msconfig' and press Return. Under the General tab pick the selective startup and pick your options. Also, in Task Manager, click the Startup tab and disable any programs you don't need or don't recognise. Don't worry too much here, as there should be no essential items here.

With most unwanted items disabled, try booting up as normal to see if the PC works as normal. Hopefully it will, and you'll then be able to slowly add items back into startup to see which causes the problem to return, thus locating your troublemaker.

If you do find that the PC is also running slowly, it's possible you may have some form of malware on your system, so make sure you also run antivirus and anti-malware scans to try and locate and eliminate any infections.

▼ You can access Safe Mode via the normal shut down menu



Silent HDMI

I've decided to make use of my laptop's ability to use HDMI, and output it to my big-screen TV. When the system first booted up I noticed the display came up as normal, but I had no sound. This didn't just mean I couldn't hear music or video, but also meant I didn't hear Windows sounds or alerts.

If I unplug the HDMI, the sound works fine, but I obviously can't use my TV via the connection. I've tried tuning on the laptop, TV, and connecting the HDMI in various orders, but the same issue returns, and I can't hear anything.

I've heard that some HDMI cables are better quality than others, so I'm thinking of buying a more expensive one to check. I'd like to know what you think first before I do this. I hope you can help. Also, are expensive HDMI cables worth it?

Neil

I'd hold off on buying a new cable, Neil. While it's debatable whether or not expensive HDMI cables are worthwhile, I don't think you have a problem here. Instead, I'm sure the problem lies with your Windows audio setup. Specifically,

you just need to tell the system that you wish you use HDMI audio instead of your standard audio.

The switch to HDMI isn't always taken care of by your system or OS, and often you need to actually do this yourself. So, with the HDMI plugged in and TV on, open up Control Panel and go to Hardware and Sound > Sound. Here you'll see the various playback devices your system can use, which should also include the HDMI audio. You need to make sure that this is the selected and active option. Once you do this, you should then get the HDMI audio you're looking for.

As I said, many people debate the quality of HDMI cables and argue about how worthwhile it is to spend more money. There's the camp that doesn't believe there's any difference, and any claim to the contrary is just marketing speak to sell more expensive products, and there are those who believe you need to buy a higher quality cable to get the best performance from your hardware, even going as far as to experiment and benchmark various cables.

Personally, I've never had much of a problem with bundled or cheaper HDMI cables, although I have run into some

strange sound problems with some cables. Oddly, a cheaper cable fixed the problem, hinting at a faulty cable, rather than any problem with overall quality.

I'd always stick to the cheaper option if it works for you, and if possible, see if you can test a more expensive cable in the shop if allowed. Even then, any differences between cables can often be hard to spot with the naked eye, and unless you run all manner of detailed tests, you'll usually not notice a huge difference.

▼ HDMI cable vary in price, but the expensive ones are not necessarily the best



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Jason

Life In The Fast Lane

When I built my current PC about a year ago, I fitted it out with my first ever SSD, a 500GB 850 Evo (Samsung). I've no complaints, but it connects via SATA 3.0, which I know is getting on a bit now. My motherboard, an ASRock Z170 Pro, has an M.2 socket, so I'm thinking of slotting in a 512GB 950 Pro (Samsung again). Would this upgrade be worthwhile? Also, I understand that not all M.2 sockets offer the same performance. Is the socket on the Z170 Pro a good one or a rubbish one?

George, South Yorkshire

You're 100% correct, George. As I've reported in these pages before, the M.2 socket provides a SATA 3.0 interface and a SATA Express interface. The SATA Express interface can be configured as either a two-lane or four-lane PCIe slot, using either PCIe 2.x or PCIe 3.x. PCIe 3.x x4 delivers a bandwidth of nearly 4GB/s, while PCIe 2.x x2 delivers just 1GB/s (still way ahead of the 600MB/s of SATA 3.0). The M.2 socket on your ASRock Z170 Pro4 is the best type available.

But should you use it? Well, in terms of sustained-transfer speeds, your 500GB 850 Evo can read at up to 540MB/s and write at up to 520MB/s. That's near enough as good as it gets under SATA 3.0. On the other hand, the 512GB 950 Pro can read at up to 2,500MB/s and write at up to 1,500MB/s. Wow! The full-fat M.2 socket really is the business.

However, monster read and write speeds are only utilised under special circumstances or when enormous quantities of data are transferred between drives of similar performance. In mainstream use, sky-high sustained-transfer figures are pretty much meaningless.

Latency is a different matter. These days, latency tends to be measured in IOPS (input/output operations per second). The higher the IOPS score, the faster a drive can find the file you want to read, or the faster it can find the empty block

you want to write to. The higher the number, the lower the latency.

A traditional HDD will have IOPS scores something like this: 200 read; 150 write.* Your 500GB 850 Evo has the following: 98,000 read; 90,000 write. And for the 512GB 950 Pro: 300,000 read; 110,000 write. Even the cheapest modern SSDs have IOPS scores that are orders of magnitude higher than those of any HDD, and it's this, not sustained-transfer performance, that makes an SSD-equipped PC feel ultra-responsive.

But would you notice the difference between 98,000 IOPS and 300,000 IOPS? In normal use, probably not. In a server, yes. For you, George, I suggest that the IOPS angle alone isn't anywhere near sufficient to warrant an upgrade. My advice might have been different if you were building a new PC, but then again, PCIe M.2 SSDs can be as much as 50% more expensive than their 2.5" SATA equivalents. I'm not convinced they're worth the wonga just yet.

If you do decide to go for it, please bear in mind that many PCIe M.2 SSDs come in two flavours: one using the older, AHCI data protocol (also employed by SATA drives); one using the newer, NVMe data protocol. NVMe has no real impact on sustained-transfer speeds, but it can push IOPS performance through the roof. Don't buy the wrong model! † Samsung isn't the only game in town, of course, but if you're really set on the 950 Pro, you can't go wrong, as no AHCI variant exists. ‡ If it did, its IOPS scores would be similar to those of your 850 Evo.

* All the given IOPS scores are for 4KB QD32.

† Not all M.2 sockets support NVMe. The one on the ASRock Z170 Pro4 does.

‡ You may want to wait for the 960 Evo and 960 Pro, which are about to hit the shelves.

▼ There's a lot to consider when buying an M.2-based SSD, including whether it's worth it



Fan Mail

The fan on my GeForce GTX 750 Ti has failed. The card's a bog-standard Zotac model – nothing fancy. I don't want to damage it by letting it overheat (though I only found out about the fan when the PC crashed), so for now I've replaced it with an old GeForce GT 420. I like my games, so this won't do in the long term! Equally, however, I'm skint, so a new card's not currently an option. Can the fan on the Zotac be replaced? If so, how easy would this be to do, and how expensive?

Roger Redman, TalkTalk

Good news, Roger. It's the whole cooler you should replace, not merely the fan, and the coolers on most graphics cards can be removed simply by undoing a few screws and pressing down a few push-pins. The key is to ensure that the mounting points on the replacement match those on the card. They need to be the correct distance apart and in the correct arrangement.

Of course, you can measure up the mounting points once you've taken the original cooler off. The relevant figures for any replacement should be provided in its specifications. Thankfully, many coolers are 'universal' and come with multiple brackets or adjustable brackets, making them compatible with a whole slew of different cards.

One such cooler is the ARCTIC Accelero L2 Plus. Read about it at goo.gl/wula0C. It's perfect for budget and mid-range cards, and the standard GTX 750 Ti is definitely on the compatibility list. About £15 is all you'll need to pay. It's good for cards drawing up to 120W, and your card only draws about 60W. Be sure to clean off the card's

old thermal paste – the new cooler should be pre-applied with the company's own quality MX-4 (or else there'll be some in a tube).

▼ *It's usually pretty straightforward to replace the cooler on a graphics card*



Bad Form

I have a bizarre problem with eBay. When I'm typing an answer to a question about an item I'm selling, or when I'm typing a question myself about an item someone else is selling, quite often the Chrome tab will crash. I get the usual 'Aw, Snap!' message. This only seems to happen if I take more than about two minutes. It's like a time-out. Of course, I then lose what I've written and have to start again. Argh!

Oddly, this only happens on eBay, though similar issues aren't uncommon. For example, I can't be the only one who's filled out an online registration form, clicked the browser's back button to return to a previous page (usually to change something), and then found that the information entered on later pages has now vanished. Is there a feature in Chrome that can 'remember' entered text, meaning nothing's ever lost in these situations?

A. Jeffries, Gmail

Few things in online life are more frustrating than losing data from a form or text window. I've had it happen more times than I've had hot heatsinks. I've fallen foul of that eBay gotcha too. Maybe there's a bug either on the eBay site or in Chrome itself, or maybe there's some quirk in both of our system configurations. If I had to rank the potential culprits in order of likelihood, I'd put eBay first, Chrome second, and you and me last.

What can be done? Well, you'd think someone would have made a Chrome extension that shoves form data into a cache, allowing retrieval as required. And someone has. The extension that always gets mentioned is Lazarus, available here (on the Chrome Web Store): goo.gl/YrDkP8. I tried this years ago and got nowhere fast, and I've just tried it again and got nowhere even faster. It looks as though it's dropped out of active development.

A better bet is an extension called TIRE – Text Input Recovery Extension. That's here (again, on the Chrome Web Store): goo.gl/81mjFt. I've just installed it, and it works – sort of. Sadly, it seems very hit-and-miss – you can't rely on it, that's for sure. Success is reasonable when losing replies to eBay questions or posts in the Micro Mart forums, but I've not tried a full-fat form. I'm not optimistic.

TIRE is still in active development, though not with any urgency. It's a hobby project, worked on as and when. Currently it's still very much a beta – the version number is 0.0.0.6. Do any readers know of a better solution? On the face of it, you'd think it would be a doddle to capture entered text and cache it to some sort of clipboard, but evidently it's really quite difficult.

Note – Lazarus is also available for Firefox (on Mozilla's Add-ons site): goo.gl/VFNAoQ. Perhaps it fares better there (I suppose I should find out, but somehow I just can't face going back to Firefox after all these years). TIRE appears to be Chrome-only.

▼ *TIREd of losing text from forms and windows when something goes wrong?*



Crowdfunding Corner

Crowdfunding Corner often features hardware designed for mobile devices, but this week we've got a special treat: two projects for your Desktop PC

BetterSpot VPN Router

With ISPs getting more and more intrusive in how they monitor and shape traffic, VPN services are a great way to take back control of your connection. VPNs can help users bypass online censorship and geographic restrictions by anonymising traffic and its origins.

After 5+ years providing VPN services to over 40 million users, Betternet is creating the BetterSpot VPN router using Kickstarter. Rather than requiring you to put your VPN details into every device you use, the BetterSpot router translates your traffic on-the-fly, meaning everything you connect with, from your console to your desktop PC to your Internet Fridge can automatically take advantage of the extra security on your Internet connection.

The project has already got a lot of confidence from backers, having doubled its CAD\$100,000 goal in little over a week. The cheapest way to get a router and free one-year subscription to Betternet's VPN service is to back the project for CAD\$165 (£97), saving you CAD\$40 (£24), while higher tiers give you the ability to buy more (saving more) and even the chance of buying a lifetime subscription – not a bad deal for VPN fans. The device is planned to ship in January 2017, so there's not even long to wait.

URL: kck.st/2cofKHn

Funding Ends: Friday, October 14th 2016



Protean Reactive Keyboard

PC gamers are often downright evangelical about playing on mouse and keyboard, so it's no surprise that there are people who are enthusiastic about creating the ultimate gaming devices.

This keyboard, created by a British-based company, is a fully programmable gaming model with a screen in every key. These screens can be fully customised, and even give visual feedback about information in-game, such as cooldowns and health, or even system information (like latency or temperature), displaying it right on the keys just in your peripheral vision.

An open API and configuration software means you'll be able to do lots with the hardware, and the launch plan involves supporting the top 100 most user-requested applications right out of the box. The project's goal is quite ambitious, at £150,000, but it's got over a month to go and is racking up backers.

You can get the basic package by backing the project at £159, which means you'll receive the keyboard, two replacement keys and a key-puller. Delivery is planned for April 2017, though this is a limited time offer – if you miss it you'll have to pay for one of the higher tiers, with the full price of this package set at £224.

URL: kck.st/2cvQSkM

Funding Ends: Tuesday, November 1st 2016



Disclaimer: Images shown may be prototypes and Micro Mart does not formally endorse or guarantee any of the projects listed. Back them at your own risk!

App Of The Week

Stephen Hawking's Pocket Universe

We attempt to get our heads around advanced physics this week

Originally published in 1988 by Transworld, Professor Stephen Hawking's *A Brief History of Time* has sold more than 11 million copies and has been translated into 40 languages. It's an incredibly successful book, and now we can enjoy it as a new interactive app.

It's widely regarded as one of the greatest science books of the 20th century and covered everything from how space is shaped by gravity, singularity theorems, the No Boundary Proposal and Hawking Radiation.

Most of it is well and truly over our heads. We can get a basic grip of what's going on, to some degree, but the more advanced cosmology aspects tend to leave us feeling a little starry-eyed and unsure as to what day it is, let alone

the concept of what happens inside a quantum singularity.

Working with Preloaded, a BAFTA winning games development studio, Transworld Publishers has released a digital and interactive version of the book to a new generation of mobile-using readers.

Pocket Universe takes Professor Hawking's concepts from *A Brief History of Time* and presents them in an easy-to-understand graphical and interactive form. The topics are viewed through 'Light-Bulb' moments, as you travel through the various concepts, leading from idea to idea.

There's also new content presented, from Professor Hawking himself, which has been discovered or theorised since

Features At A Glance

- Beautifully designed and easy to navigate.
- Easy-to-understand full illustrations to explain complex science.
- A thorough integrated glossary.
- Keep a personal record of your progress through the app.
- Share your own lightbulb moments through social media.

the book's original launch and subsequent editions thereafter.

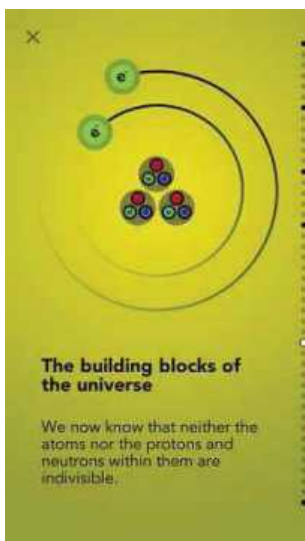
In addition to being able to travel from the big bang to modern theories of space-time at your own pace, you'll also be able to share your Light-Bulb moments with others via social media.

"I'm delighted that my original text is getting a new lease of life in the form of an app. I have seen the plans and I'm excited to see the final product. I hope the app will bring my work to a whole new generation of people looking to find out how it all began," says Professor Hawking. The new app will certainly help those who have the ability to understand the concepts, but either lack the ability to read through the book or the ability to get hold of it.

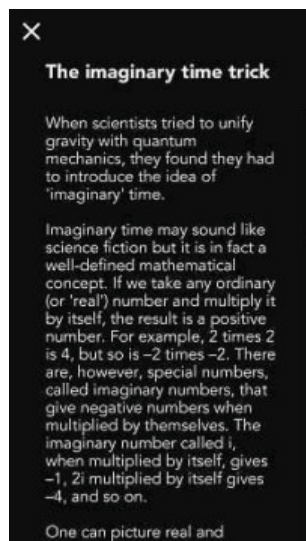
Using the visual and interactive functions of the app will hopefully ignite the inner scientist of a new generation.

At present, Pocket Universe is only available on iOS, but there is a possibility that it'll come to Android device in the near future.

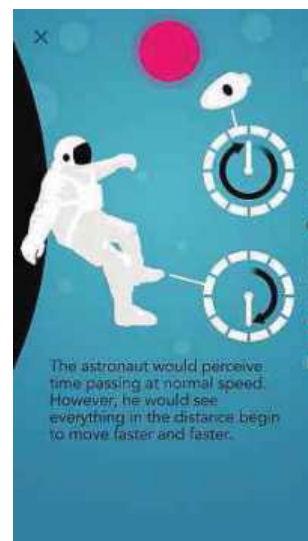
If you love science and you want to further your understanding of Professor Hawking's iconic book, then Pocket Universe will certainly help you get a firmer grip on the revolutionary ideas that are presented to the scientific community. [mm](#)



▲ Professor Stephen Hawking's *A Brief History of Time* presented in app form



▲ Errrr... What?



▲ What we gather is that it's not good to fall into a black hole

Logging Off

If you haven't caught the distant flogging of an ex-equine, Microsoft has been making great efforts to push the Edge browser forward as the next big thing. As part of this strategy, it's found one thing that Edge is allegedly good at, not using laptop battery power, and pushed this angle for all it's worth.

Some have questioned Microsoft's testing methods, and suggested that it ran the tests on hardware it designed, but let's assume that Edge has this one plus point.

What it sadly doesn't do is address all the other problems with Edge, like horrible instability, that makes people try it once and then just return to Chrome or Firefox or even Opera. Most people like one specific browser, and for some considerable time it hasn't been the one that Microsoft bundles with its operating system.

Part of Edge's credibility issue, other than the actual user experience, is that not even Microsoft is fully committed to it. We know that because it didn't actually remove Internet Explorer from Windows 10, always on hand for when Edge can't cut it.

This is where in trying to explain this Microsoft digs a deep hole, because its excuse for including IE is 'legacy' and it's one that it created single-handedly. It created the ActiveX component system, and then convinced many corporates to use them, and they duly obliged. Edge won't run these, because just like Flash they're inherently insecure and built for an era when IE 6 was the cutting edge of browser technology. But critically, Edge doesn't support the plug-ins necessary, and although it might get some plug-in support down the line, ActiveX almost certainly won't be one of them.

Actually to be completely accurate, IE doesn't support ActiveX by default since Window 8.1 either, but it can be made to work.

This seems entirely at odds with the company's refocus on business, because there isn't any way that corporate customers will use Edge and then have their users complain that even their own web tools don't work under Windows 10.

What we have here is the overlap of Microsoft's strategies that change with seasonal rapidity and are often made without any long-term plan or consideration.

In its defence, the people who cooked up ActiveX (and Silverlight, for that matter) probably moved on a while ago or weren't in the meetings where Edge was formalised.

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In that meeting, when the subject of plug-ins and corporate use of ActiveX was mentioned, if it ever was, surely the reposte was that you can only drag so much legacy junk forward to the future.

That's true, but when you've invested in promoting the use of something in business and encouraged others to also invest just shrugging your shoulders isn't a sufficient response, is it?

At the heart of this schism is another, where the changing plans of one company affects those of others who didn't change their plan at all. In business, changing plan has a cost — one that many won't accept unless it's utterly necessary.

With the completely disconnected thinking that brought corporates ActiveX and then Edge that can't use it, Microsoft's ability to influence its customers becomes ever weaker.

Edge is a victim of both its own new thinking and the legacy that spawned it.

Mark Dickavance

LAST WEEK'S CROSSWORD

Across: 7 Dow Jones Index, 8 Psyche, 9 Acuity, 10 Tyranny, 12 Biome, 14 Issue, 16 Gossips, 19 Smithy, 20 Parity, 22 Atomic Numbers.

Down: 1 Boss, 2 Ejecta, 3 Antenna, 4 CS Gas, 5 Annuli, 6 Beat Em Up, 11 Yosemite, 13 Pompous, 15 Ultimo, 17 Scribe, 18 Synch, 21 Turn.

DISCLAIMER

The views expressed by contributors are not necessarily those of the publishers. Every care is taken to ensure that the contents of the magazine are accurate but the publishers cannot accept responsibility for errors. While reasonable care is taken when accepting advertisements, the publishers cannot accept any responsibility for any resulting unsatisfactory transactions. Although we don't do it quite as often as we used to, occasionally we still find the time to play a videogame or two. This week, we've mostly been rediscovering older titles that we stopped playing for some reason or other. Our games of choice at the moment are the ridiculously addictive New Star Soccer, This

War of Mine and Starcraft II. And we have to say, we'd forgotten just how depressing This War of Mine is, and how terrible we are at making our survivors actually survive. We're pretty sure if we ever had to live through a real war, we'd last less than a week. And we'd only get that far by selling or trading the rest of the team. After all, who needs a bunch technology writers anyway? As for Starcraft, we were once again reminded that we have almost no tactical awareness and no idea what to do beyond charging in with all guns blazing. Clearly, then, if there was a real war, we should not be put in charge of anything more important than perhaps holding someone's hat or making sure everyone has clean socks on.

THIS WEEK'S CROSSWORD

Across

7 A dedicated website or other application which enables users to communicate with each other by posting information, comments, messages, images, etc. (6,7)

8 An occupation for which you are especially well suited. (6)

9 Produce electric current by electrostatic or magnetic processes. (6)

10 The time or date at which the sun crosses the celestial equator, when day and night are of equal length. (7)

12 Decompress a compressed file. (5)

14 A region in space that is defined by a vector function. (5)

16 Stop something happening or someone from doing something. (7)

19 The measure of the force acting on a body. (6)

20 The ship computer system which is under the control of 'The Many' in the video game System Shock 2. (6)

22 Instruments for measuring the intensity of odours. (13)

Down

1 Each of two terminals positive and negative of an electric cell or machine. (4)

2 An atoll in the Marshall Islands; formerly used by the United States as a site for testing nuclear weapons. (6)

3 French aviator who in 1909 made the first flight across the English Channel. (7)

4 Produce a different version of a musical recording by altering the balance of the separate tracks. (5)

5 .se TLD. (6)

6 A measure of the resistance felt when sliding one body over another. (8)

11 In statistics any of the five equals parts into which a sample population can be divided depending on the value of a variable. (8)

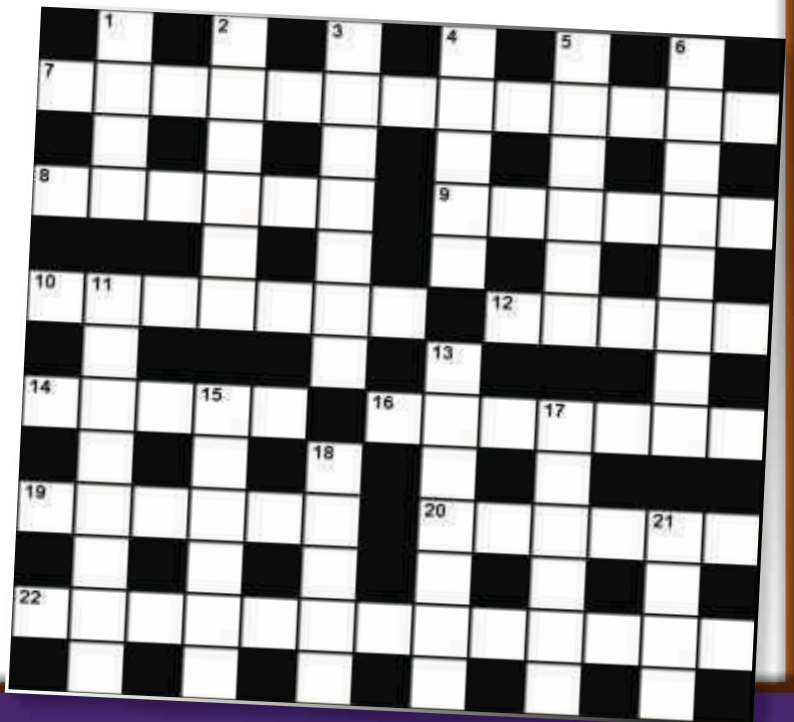
13 A faint red dwarf star associated with the bright binary star Alpha Centauri. It is the closest known star to the solar system. (7)

15 The amount of drift of a floating object caused by the component of the wind vector that is perpendicular to the object's forward motion. (6)

17 An enduring or necessary ethical or aesthetic truth. (6)

18 Popular file transfer application from Ipswich. (5)

21 The single European currency. (4)



In Next Week's Micro Mart*

- PC graphics special! Choosing the right GPU, overclocking it and more!
- Has eSATA outlived its usefulness?
- How and why people are fighting technology with technology
- The best time-saving apps
- Plus the usual mix of news, features, reviews and advice



* May be subject to change

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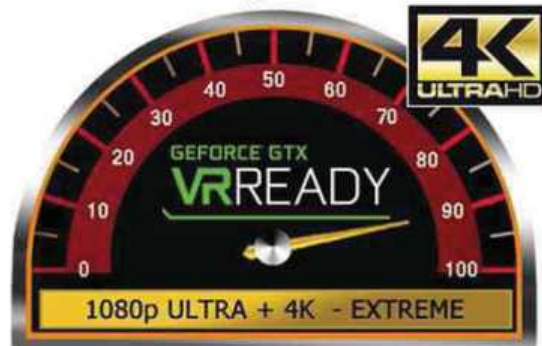


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